RETALIATORY AGGRESSIVE DRIVING: A JUSTICE PERSPECTIVE

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Abstract

Aggressive driving behaviours such as rude hand gestures, horn honking, tailgating, or causing damage to another vehicle continue to be a threat to motorist well-being. Based on the General Aggression Model and the attribution-of-blame model of injustice, the current study developed and tested a model of aggressive driving that included individual differences and cognitions related to the perception of injustice, driving anger, and retaliatory aggressive driving. A sample of 269 undergraduate students viewed five animated unjust driving scenarios and responded to items assessing cognitive, emotional, and behavioural responses. Results supported a model of aggressive driving suggesting that the belief in an unjust world contributes to perceptions of injustice via sensitivity to unjust events, and from perceptions of injustice to retaliatory aggressive driving via driving anger. Results also provided support for an attribution model of perceptions of injustice and provided a unique investigation of these attributions and perceptions in the driving environment. The current study also developed and found support for a new measure of driving justice sensitivity that may prove to be useful for future driving research. As a whole, this study provides a unique examination retaliatory aggressive driving, and data that can contribute to driving training programs to help reduce driving aggression.

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Introduction

On August 24th, 2011, a Vancouver motorist was punched by an irate driver. The irate driver then used his vehicle to ram and pin the victim between the two vehicles. Such violent and aggressive driving behaviour has been referred to as road rage. Between 1998 and 2000, 59 road rage incidents were reported in Canadian newspapers (Smart & Mann, 2002). Criminal charges were laid in over 70% of these incidents and four incidents involved a fatality. Although these serious forms of aggression on the road are not unheard of, they are less common. Less serious forms of driver aggression such as horn honking and tailgating appear to be more common (Hennessy, 2000). A survey of 1,395 Ontario residents reported that almost half had been shouted at, cursed at, or had rude hand gestures directed towards them (Smart, Mann, & Stoduto, 2003). A content analysis of 5315 online driver complaints identified 1746 complaints that mentioned aggressive driving behaviour (Wickens, Wiesenthal, Hall, & Roseborough, 2011). The problem of aggressive driving is not unique to North America. A survey of 2380 Australian drivers found that 82% of drivers reported having ever been recipients of mild forms of driver aggression and approximately 30% had been followed or chased by another driver (AAMI, 2007). Self-report research of 3740 Australian drivers found that 50% had verbally abused another driver, 38% had displayed a rude hand gesture, and 18% had followed close to another vehicle in anger (AAMI, 2011). Additional, self-repot research has found that drivers in Finland, Great Britain, Greece, Iran, The Netherlands, and Turkey reported using the horn to indicate annoyance or chasing another vehicle in anger (Özkan, Lajunen, Chliaoutakis, Parker, & Summala, 2006). As aggressive driving is a multi-national problem, it is important that its causes be identified in order to limit its occurrence. In some instances, aggressive driving may represent

retaliatory behaviour in response to a perceived injustice. The purpose of this study was to provide a better understanding of what leads to such behaviour. To achieve this goal, the current study examined the influence of individual differences on driver emotion and cognition, and the subsequent influences of emotion and cognition on driver behaviour.

Aggressive Driving

Currently, there is no consensus on a definition of aggressive driving (Wiesenthal, Lustman, & Roseborough, under peer review). General aggression has been defined as "behavior directed toward another individual that is carried out with the *proximate* (immediate) intent to cause harm" (Anderson & Bushman, 2002, p. 28). As driving aggression is a specific form of aggression, the definition of aggressive driving should fit the general definition. The American Automobile Association has defined aggressive driving as the operation of a motor vehicle without regard to others' safety (Tasca, 2000). Such a definition is problematic in that it represents all of the following behaviours: speeding, tailgating, making unsafe lane changes, failing to yield the right of way, running stop signs, and horn honking. Speeding and running stop signs however, are two behaviours that can be performed without intent to harm and in the absence of other drivers. Recall that Anderson and Bushman's (2002) definition includes the intention of causing *harm*. Harm can be both physical and psychological. Therefore, aggressive driving behaviours should not be limited to behaviours intended to cause physical injury or vehicle damage. Behaviours not intended to cause physical harm may include verbal abuse, rude hand gestures, or horn honking. The current study examines a specific form of driving aggression in retaliation to a perceived injustice. Therefore, the current study's definition of retaliatory aggressive driving is: *behaviour performed with the intent to cause physical or psychological*

harm, directed towards another motorist or vehicle that has been perceived to have committed an injustice.

General Aggression Model

The General Aggression Model (GAM: Anderson & Bushman, 2002) is a theoretical framework that uses an interactional approach. In doing so, the theory incorporates personality, cognitive, attitudinal, and physiological factors into a model, providing a better understanding of aggression (Anderson & Bushman, 2002). The framework of the GAM is based on *both* situational and individual factors. The GAM focuses on one *episode*, represented by a single individual (i.e., the possible aggressor) in a single situation. Each episode consists of three *foci*: inputs, routes, and outcomes. *Inputs* are features of the specific situation that either increase or inhibit acts of aggression. There are two types of inputs, situation and person inputs. Situation inputs include personal discomfort, drug usage, alcohol usage, frustration, and interpersonal provocation (Anderson & Bushman, 2002). Person inputs include genetic predisposition, personality traits, attitudes, beliefs, and long-term goals (Anderson & Bushman, 2002). *Routes* are equivalent to an individual's internal state, and they represent the second component of an episode. During an episode, inputs (e.g., personality, alcohol) contribute to an individual's present internal state. The GAM proposes that an individual's internal state consists of arousal, cognition, and affect that are important in the formation of aggression (Anderson & Bushman, 2002). The final focus of the GAM is the *outcome* or resulting behaviour. The outcome is a result of inputs and routes (Anderson & Bushman, 2002). The GAM can be found in Figure 1 in Appendix A.

The GAM and Aggression Research

The GAM has been used extensively in the aggression literature. The GAM has been used most commonly to explain impact of violent forms of media on aggression and workplace aggression (Anderson et al., 2004; Restubog, Garcia, Wang, & Cheng, 2010). Anderson et al. (2004) examined the effect of exposure of violent videos on aggressive cognitions. Results indicated that increased exposure to violent video games was related to increased aggressive cognitions that were related to increases in self-reported aggressive behaviour. The GAM proved to be a successful framework for Restubog et al. (2010), who examined the mediating role of self-control between workplace aggression and trait anger, and workplace deviance and the belief that retribution is an acceptable response to mistreatment. While increased trait anger and beliefs about the acceptability retribution were related to increased workplace deviance, individuals possessing increased self-control of angry or hostile cognition engaged in less deviance. These results supported the GAM hypothesis that inputs (traits and beliefs) led to outcomes (deviance) via internal states (cognition). The GAM has also been used as a framework to link alcohol use and aggression. Alcohol consumption (input) facilitated the increase in individuals' level of state anxiety (internal state), mediating the relationship between alcohol use and aggressive behaviour (outcome) (Parrott, Gallagher, & Zeichner, 2012). These various studies and results support the GAM as a useful framework for explaining aggression outside of the driving environment.

The GAM and Driving Aggression Research

Recently, the GAM has been considered by the driving literature as a way to provide a better understanding of aggressive driving (Lustman, Wiesenthal, & Flett, 2010; Nesbit, Blankenship, & Murray, 2012; Roseborough, Wiesenthal, Flett, & Cribbie, 2011; Wickens,

Wiesenthal, Flora, & Flett, 2011). Lustman et al. (2010) found that participants reported more anger when they ascribed more intentionality and inconsideration to a driver's offensive behaviour. Furthermore, increased driver anger was predictive of an increased likelihood to respond aggressively. Lustman and colleagues' (2010) results provided partial support for the GAM, such that internal states (i.e., attributions and anger) influenced each other and influenced outcomes (i.e., aggressive responses). Similarly, research by Wickens, Wiesenthal, Flora, et al. (2011) provided support for the GAM's ability to explain aggression in the driving environment. Participants who attributed more control, intentionality, and causation to a driver's behaviour felt the driver was more responsible, resulting in increased anger and likelihood of aggressive behaviour. Full support for the GAM was provided by Nesbit et al. (2012) who identified that individual differences in endorsement of the belief in a just world were related to anger and anger-related cognitions, which in turn influenced aggressive driving responses to offensive behaviours. Individuals with an increased endorsement of just world beliefs reported less anger and less anger-related cognitions that were related to a reduced likelihood of aggressive driving. Most pertinent to the current study is research conducted by Roseborough et al. (2011) that examined the influence of individual differences in unjust world beliefs on attributions of injustice, driving anger, and aggressive driving behaviour in response to offensive driving behaviours. Results indicated that increased endorsement of a belief in an unjust world led individuals to make more attributions that contributed to perceptions of injustice. In turn, the increased perceptions contributed to increased anger that increased participants' likelihood of retaliatory aggressive driving. As a whole, the results of Lustman et al. (2010), Wickens, Wiesenthal, Flora, et al. (2011), Nesbit et al. (2012), and Roseborough et al. (2011) support the

GAM's hypothesised path from situation and person inputs, to internal states, to outcome behaviour.

An Extension of a Previous Model of Retaliatory Aggressive Driving

The model proposed by the current study is an extension of a model developed by previous aggressive driving research (Roseborough et al., 2011). Both the original and current models of retaliatory aggressive driving are based on the framework of the GAM. The original model examined the influence of personality traits, which are only one group of variables the GAM proposes as influential in aggression formation. Specifically, Roseborough et al. (2011) proposed that increased belief in an unjust world would be related to increased perceptions of injustice. Support for the relationship between the belief in an unjust world and perception of injustice was inconsistent (Roseborough et al., 2011). To provide a better understanding of the relationship between the belief in an unjust world and perceptions of injustice, the current model extends previous research by accounting for the influence of sensitivity to injustice and attitudes related to unjust behaviour. The original model of retaliatory aggressive driving and the model proposed by the current study are depicted in Figure 2 and Figure 3 in Appendix A, respectively.

The ability of the original model to explain retaliatory aggressive driving may have been limited due to the conceptualization of the perception of injustice. The original conceptualization was based on a model of perception of injustice proposed by Mikula (1993). Mikula's (1993) model proposed that the perception of injustice was a result of the direct influence of five attributions: intentionality, causation, controllability, lack of justification, and violation of entitlement. To avoid the limitations of previous research, the current study used a newer conceptualization of the perception of injustice (Mikula, 2003). The newer conceptualization

proposes two additional factors (i.e., attributions of blame and responsibility) and possesses increased structural complexity (i.e., indirect relationships among attribution factors).

Relationships between the belief in an unjust world and anger, as well as perceptions of injustice and anger were proposed and supported by the original model (Roseborough et al., 2011). Finally, results supported proposed relationships between perceptions of injustice and aggression, as well as anger and aggression. Examination of these final relationships was extended by the current study by the proposal and analysis of a mediated relationship from the perception of injustice to retaliatory aggressive driving via driving anger. All of the relationships and variables included in the current model are outlined below using the framework of the GAM (i.e., inputs, routes, and outcome).

Situation Inputs

As mentioned earlier, a situation input is an environmental factor (e.g., goal impedance, the presence of guns or drugs) that influences cognitions, affect, or arousal. The situation input examined in the current study was an interpersonal provocation, specifically, an unjust driving behaviour. Injustice is said to occur when an event leads an individual to believe they have not received what they deserve (Crosby, 1976; Davis, 1959; Mikula, 1993). Research on transgressive behaviour has found that injustice is a common contributing variable in a variety of contexts such as the school environment (Caillet, 2006), workplace environment (Ambrose, Seabright, & Schminke, 2002; Baron & Neuman, 1996), and sport (Faccenda, Pantaléon, & Reynes, 2009; Greenberg, Mark, & Lehman, 1985). The perception of unfairness or injustice can cause uncomfortable and distressing emotional states (Adams, 1965; Markovsky, 1988). Unjust decisions by referees have been shown to increase anger in soccer players (Canovas, Reynes, Ferrand, Pantaléon, & Long, 2008). Injustice also influences behaviour that enables victims of

injustice to defend their integrity (Mikula, 1993). Organisational research has shown that injustice reduces employee cooperation (Lind, 2001) and commitment (Cropanzano & Randall, 1993; Greenberg, 1993; Sweeney & McFarlin, 1997), and increases sabotage (Ambrose et al., 2002), and aggression (Baron, Neuman, & Geddes, 1999). Research on students has shown that injustice is a contributing factor to aggression in schools (Salhani, Derghal, & Henerr, 2005).

Person Inputs

As mentioned earlier, person inputs are factors including genetic predisposition, personality traits, attitudes, beliefs, and long-term goals that influence an individual's behaviour (Anderson & Bushman, 2002). The current study examined the influence of individual's beliefs, attitudes, age, and gender.

World Beliefs. While injustice can be defined by characteristics of a situation, a person's personality or individual characteristics can influence perceptions of injustice. This study examined the influence of belief in an *unjust* world on the perception of injustice. The belief in an unjust world is the belief that people *do not* get what they deserve (Lench & Chang, 2007). To obtain a more comprehensive understanding of the belief in an *unjust* world it is necessary to understand the influences of the belief in a *just* world.

Belief in a Just World. The belief in a just world is the belief that people (i.e., the self and others) generally get what they deserve (Lerner & Miller, 1978). This positive view of the world acts as a cognitive framework allowing individuals to interpret events that occur in their world. Just events are perceived to be a result of a person's actions and a just world. The belief in a just world allows individuals to interpret unjust events as being due to external or unstable factors, playing-down the severity of the injustice and avoiding self-rumination (Dalbert, 1997; Lipkus & Siegler, 1993). Increased endorsement of the belief in a just world is also related to

reduced anger during potentially anger-evoking situations (Dalbert, 2002; for reviews of the original and more recent research on the belief in a just world please see Furnham, 2003; Lerner & Miller, 1978). Little research has examined the influence of the belief in a just world and its influence in the driving environment, and has mainly examined its influence on perceptions of victims of drunk driving (Hammock & Richardson, 1993; Taylor & Kleinke, 1992).

One study has examined the influence of the belief in a just world on driving anger and aggression in response to anger-evoking driving situations (Nesbit et al., 2012). The belief in a just world had several positive influences. Increased endorsement of just world beliefs had a negative relationship with prior aggressive driving behaviour. If individuals believe the world is just, and that good things happen to good people and bad things happen to bad people, it is likely they will not want to engage in bad behaviour. Increased endorsement of the belief in a just world was also related to reduced anger, angry thoughts, and aggressive driving intentions when presented with a driving violation. The research by Nesbit et al. (2012) suggests that just world beliefs have a beneficial influence on the well-being of drivers.

Rubin and Peplau (1973, 1975) developed the first measure of just world beliefs, the Just World Scale (JWS). This measure treated the belief in a just world as a one-dimensional factor. The factor ranged from believing in a just world to not believing in a just world. Since the development of the JWS there has been an ongoing debate about the factor structure of the JWS. Prior research supports one-, two-, and multi-dimensional factor structures (Ahmed & Stewart, 1985; O'Quin & Vogler, 1990). The more common finding seems to be a two-factor structure, that is, just and unjust world factors (Couch, 1998; Loo, 2002; Whatley, 1993). These findings suggest that an individual can believe in both a just and unjust world.

Belief in an Unjust World. As noted, the current study will examine the influence of the belief in an unjust world on driver cognitions, emotion, and behaviour. While it is beneficial for an individual to believe in a just world, temporarily believing in an unjust world is thought to help individuals cope with personal injustice (Dolinski, 1996). Therefore, at low levels, the belief in an unjust world may prove beneficial to one's psychological well-being (Dolinski, 1996). At high levels however, the belief in an unjust world appears to have negative influences on well-being. Increased endorsement of the belief in an unjust world is linked to an increased tendency to perceive situations as unjust, as well as increased levels of state anger (Lench & Chang, 2007). Belief in an unjust world may also influence behaviour. Dalbert et al. (2001) found that prisoners, compared to prison guards, were more likely to endorse unjust world beliefs. It may be that believing in an unjust world reduces guilt and cognitive dissonance associated with the commission of a crime, making it easier for the individual to break the law. Furthermore, research has also identified a negative relationship between the just and unjust world beliefs (Dalbert, Lipkus, Sallay, & Goch, 2001; Lench & Chang, 2007). Although individuals may endorse beliefs in both worlds, persons with an increased endorsement of unjust world beliefs are more likely to possess reduced endorsement of just world beliefs. As a result, individuals possessing increased unjust world beliefs are more likely to possess the maladaptive cognitive and affective traits, and less likely to possess the adaptive traits associated with just world beliefs.

As the belief in an unjust world is likely to increase anger, perceptions of injustice, and unjust behaviours, it is important to consider such beliefs in explaining retaliatory aggressive driving. Limited prior research has examined the influence of the belief in an unjust world in the driving environment (Roseborough et al., 2011). Roseborough et al. (2011) proposed that

increased endorsement of the belief in an unjust world would be linked to increased perceptions of injustice. Although the relationship was not supported, the belief in an unjust world was related to attributions that contributed to the perception of injustice (Roseborough et al.). The current study extended prior research by examining the relationship between the belief in an unjust world and the perception of injustice while considering an individual's sensitivity to injustice.

Sensitivity to Injustice. Perceiving acts of injustice may also be dependent on an individual's sensitivity to such acts. Individuals may differ in their sensitivity to moral norm violation and injustice (Schmitt, Gollwitzer, Maes, & Arbach, 2005). Schmitt, Neumann, and Montada (1995) proposed that an individual's sensitivity to injustice is comprised of four indicators – the *frequency* of experienced injustice, the intensity of *anger* after injustice, the mental *intrusiveness* of injustice, and the *punitivity* toward the perpetrator. Schmitt et al. (2005) proposed the perspectives from which individuals may perceive injustice, victim, offender, and third-party (e.g., witness).

Schmitt et al. (2005) noted that justice sensitive individuals perceive more incidents of injustice. The mechanism linking justice sensitivity and perceptions of injustice may be cognitive processing that occurs in justice sensitive individuals. Individuals possessing increased justice sensitivity attend more strongly to unjust stimuli, interpret ambiguous situations as more unjust, and possess an increased memory advantage for unjust information (Baumert, Gollwitzer, Staubach, & Schmitt, 2011). Students possessing increased sensitivity to injustice experienced greater anger following an unjust event and spent more time thinking about the event compared to students possessing reduced sensitivity to injustice (Mohiyeddini & Schmitt, 1997; Schmitt & Mohiyeddini, 1996). Sensitivity to injustice has also been shown to influence behaviour

(Gollwitzer, Rothmund, Pfeiffer, & Ensenbach, 2009). Individuals who possessed increased sensitivity to injustice were less cooperative during a social dilemma game after the slightest indication that other game players were playing unfairly. The current study examined influence of sensitivity to injustice on perceptions of injustice in the driving environment.

Attitudes. Attitudes are evaluations people hold about themselves, other individuals, objects, and issues (Petty & Cacioppo, 1986). Theories of behaviour such as the GAM and the Theory of Planned Behaviour (TPB: Ajzen, 1991) propose that attitudes are an important contributing factor. The TPB proposes that behavioural intention is predicted by attitudes towards the behaviour, subjective norms regarding the performance of the behaviour, and the perception of volitional control over the performance of the behaviour (Ajzen, 1991). An enduring concern about the attitude–behaviour relationship is the ability of attitudes to predict future behaviour (Kraus, 1995). Iversen (2004) conducted a longitudinal study to determine the relation between attitudes and future risky behaviour and accident involvement. Attitudes measured earlier were predictive of subsequent risky behaviour, supporting the attitude–behaviour relationship. A meta-analysis by Kraus (1995) highlighted another way in which the attitude–behaviour relationship can be strengthened. The study found that prediction of behaviour improved when narrowly defined attitudes and behaviour were measured at corresponding levels of specificity. This finding supports Ajzen (1988) who posited that measures of broad attitudes tend to be poor predictors of behaviour, and that attitudes are more likely to predict behaviour when measures of attitudes and behaviours are at the same level of specificity. In the driving research, support can be found in a study by Iversen and Rundmo (2004) where attitudes related to rule violations, speeding, and reckless driving were significant predictors of risky driving. These results remained significant when age, gender, and years

holding a license were considered. Iversen (2004) and Iversen and Rundmo (2004) suggest that the relationship between attitudes and behaviour can be strengthened if the temporal period between attitude and behavioural assessment is reduced, and attitude and behavioural measures are specific and similar.

The current study examined attitudes towards a variety of behaviours that may be considered, risky, aggressive, or unjust. Yagil (1998) examined the relationship between attitudes towards traffic laws and the performance of such behaviours. Individuals who felt greater obligation to obey laws and endorsed positive evaluations of traffic laws displayed lower levels of traffic violations. Similarly, the TPB was used to explain four specific aberrant driving behaviours: drunk-driving, speeding, following closely, and dangerous overtaking (Parker, Manstead, Stradling, Reason, & Baxter, 1992). Individuals who possessed positive attitudes towards the aberrant behaviours were more likely to possess intentions to engage in them. The current study is interested in the influence of attitudes towards norm- or law-breaking driving behaviour by drivers in general on *perceptions* of such behaviours. Individuals possess an internal barrier that limits what information passes through the perception process based on beliefs, experience, or attitudes. This process is referred to as selective perception (Sherif & Cantril, 1945). The current study proposes that individuals who have pro-traffic law attitudes may be more likely to perceive injustice on the road.

Gender. The influence of gender on driving anger and aggression has received considerable research attention, results of which are inconclusive. Several studies have found that males and females experience a similar degree of anger in response to offensive driving behaviour (Deffenbacher, Oetting, & Lynch, 1994; Lustman et al., 2010; Roseborough et al., 2011). Aggression research examining gender influences has obtained less consistent results.

Several studies have found no significant differences in levels of aggressive driving between males and females (Dahlen, Martin, Ragan, & Kuhlman, 2005; Haje & Symbaluk, 2014; Jovanović, Lipovac, Stanojević, & Stanojević, 2011; Wickens et al., 2012). There are also a number of studies that have identified differences in levels of driving aggression between males and females. Specifically, males tend to exhibit more driving aggression than females (Parker, Lajunen, & Summala, 2002; Shinar, 1998; Wiesenthal, Hennessy, & Gibson, 2000). Additional studies have suggested there is a more complex relationship between gender and driving aggression, with a third variable influencing the relationship (Lajunen & Parker, 2001). Lustman et al. (2010) found that the gender difference in aggression was only present among individuals who had experienced increased anger. Gender differences may also be more prevalent as driving aggression increases in severity. Shinar and Compton (2004) found that the difference in aggressive driving between males and females was greatest for more severe forms of aggression. Additionally, gender differences in aggression may be more likely when specific populations are examined. Among drivers with relatively untarnished driving histories, males exhibited more driving aggression than females, but this relationship did not exist among drivers required to participate in a defensive driving course (Miles & Johnson, 2003). Finally, attitudes may play a role in the relationship between gender and driving aggression. Vengeful attitudes combined with an increased history of driving violations helped account for differences in aggressive driving between males and females (Hennessy & Wiesenthal, 2005). Due to the potential influence gender could have on driving related variables, its relationship with other variables and its contribution to the proposed model were examined.

Age. Similar to gender research, prior research has provided inconclusive results regarding the relationship between age and driving related variables. Research has identified a

negative relationship between age and driving anger (Jovanović et al., 2011) and a negative relationship between age and driving aggression. As age increases, driver anger and driver aggression in response to offensive behaviour decreases (Hennessy, Wiesenthal, Wickens, & Lustman, 2004; Jovanović et al., 2011; Shinar, 1998; Wickens, Mann, Stoduto, Ialomiteanu, & Smart, 2011). Several studies, however, have not found a significant relationship between age and driving aggression (Dahlen et al., 2005; Dukes, Clayton, Jenkins, Miller, & Rodgers, 2001; Özkan & Lajunen, 2005). It has been suggested that one possible explanation for the inconsistent results is the age range of the samples used by the studies (Dahlen et al., 2005). Samples with larger age ranges identify differences in age (Wickens, Mann, et al., 2011), whereas samples with smaller age ranges do not (Dahlen et al., 2005). The current study did not include age in the proposed model of aggressive driving; however, age's relationship with other variables and its contribution to the proposed model were examined.

Routes

Attributions. A large portion of the proposed model of retaliatory aggressive driving is comprised of the perceptions of injustice and the attributions that contribute to such perceptions. Attributions are the cognitive processes used to explain events experienced by an individual. Several attributional theories have been developed to describe these processes including the defensive attribution theory (Shaver, 1970; Walster, 1966), the fundamental attribution error (Heider, 1958; Jones & Davis, 1966), and the causal attribution theory (Weiner, 1986). These theories have also been employed by prior research to explain driver cognition and behaviour.

A consistent theme among attribution theories is that an individual's causal attributions vary depending on the target. Using the framework of the actor-observer bias, Hennessy and Jakubowski (2007) examined attributions made by individuals assuming the role of a perpetrator

or witness of a near-collision. Individuals assuming the perspective of a witness ascribed more risk to the behaviour than individuals who assumed the perspective of the driver. Research on defensive attribution theory, fundamental attribution error, and just world hypothesis identified that individuals tend to blame the driver involved in a collision rather than the environment, and that drivers involved in serious collisions are perceived as more responsible than drivers involved in minor collisions (Sanderson, 2010; Walster, 1966). These attributions allow witnesses to maintain the belief the world is predictable, resulting in increased psychological well-being (Lerner, 1980). The causal attribution theory proposes that the cause of an event will be attributed to dispositional or situational factors that are unstable or enduring (Weiner, 1986). Driving research has found that victims of aggression attribute the perpetrator's behaviour to internal and stable causes (e.g., personality, driving ability), whereas perpetrators attributed the behaviour to internal and unstable causes (e.g., driving mistakes) (Lennon, Watson, Arlidge, & Fraine, 2011). This research suggests that we attribute the negative behaviour of others to dispositional stable causal factors (e.g., driver skill, driver personality) rather than situational unstable causal factors (e.g., road conditions, driver mistakes).

Driving research has also examined the influence attributions have on the internal states of emotion and cognition. Based on Weiner's (1986) theory of attribution and similar to the current study, Wickens, Wiesenthal, Flora, et al. (2011) examined the influence of attributions of controllability, intentionality, and causality, on attributions of responsibility, driving anger and aggression. Motorists were perceived to be responsible for an offensive behaviour if the behaviour was believed to be intentional and if it was believed the motorist was the cause of and had control over the behaviour. Furthermore, observers of offensive driving behaviours who attributed increased intentionality and responsibility experienced increased anger. Attributions

may also influence hostile or retaliatory cognitions. Feather and Deverson (2000) found that drivers deemed more responsible for an offensive behaviour were deemed to be more deserving of punishment and more severe punishment. Lennon and Watson (2011) found that retaliation for an offensive behaviour was justified if the offender was believed to have acted intentionally.

Research has also identified relationships between an observer's attributions and subsequent behaviour. Britt and Garrity (2006) found that participants who read scenarios involving an offensive driving behaviour reported that they would retaliate more aggressively if they believed an offensive behaviour was typical behaviour of an offender (i.e., attributions of stability). The relationship between attributions of stability and retaliatory aggression was consistent for six scenarios. Although less consistent, retaliatory aggression was more likely if an offender's behaviour was hostile and if the offender was blamed. These results suggest that while some attributions may influence responses to numerous offensive driving behaviours, other attributions may influence responses to a specific few offensive driving behaviours.

The driving literature highlights the important role that attributions play in the driving experience. Attributions not only help us understand the events we experience, but they influence our emotion, cognition, and behaviour. Attributions are important aspects of this study for these reasons. The current study examined a specific group of attributions that contribute to the perception of injustice (Mikula, 2003).

Perception of Injustice. A standard definition of justice is that individuals get what they deserve based on who they are and what they have done (e.g., Buchanan & Mathieu, 1986; Cohen, 1986; Lerner, 1977, 1987; Mikula, 2001, 2003). In line with this definition, the basis of a perception of injustice is the perception that one's entitlement has been violated. Violations of entitlement may elicit attributional thinking to identify the cause of the violation. The attributions

may influence an individual's emotion and behaviour. Mikula (2003) developed an *attribution-of-blame* model of perceptions of injustice. The model proposed that a perception of injustice is composed of multiple elements, beginning with the perception of entitlement violation, followed by the assignment of blame for the perceived violation. Mikula (2003) posits that blame is comprised of attributions of responsibility and lack of justification. Furthermore, responsibility is proposed to be comprised of attributions of causation, controllability, and intentionality (Mikula, 2003). The contribution of attributions of causation, controllability, and intentionality to attributions of responsibility has been proposed by similar attribution research (Weiner, 1995). The current study examined the efficacy of this model to explain perceptions of injustice in the driving environment and the role perceptions of injustice have in retaliatory aggressive driving. The relationship between perceptions of injustice and aggressive driving has received little attention in driving research (Roseborough et al., 2011). Increased perceptions of injustice were predictive of state driving anger and retaliatory aggressive driving. This is the first study to examine the attribution-of-blame model proposed by Mikula (2003) in the context of driving.

State Driving Anger. The GAM posits that affect is another part of an individual's internal state. Anger was the primary affect focused on in the current study. State anger is defined as an emotional state marked by subjective feelings varying in intensity from mild annoyance or irritation to intense fury and rage (Spielberger et al., 1985; Spielberger, 1999). Over time, the intensity of state anger varies as a function of perceived attack by others or frustration resulting from blockage of goal-directed behaviour. Furthermore, anger is typically the result of the cognitive appraisal. A victim's anger typically results from the cognition that the offensive behaviour was inappropriate and intentional (Weiner, Graham, & Chandler, 1982). The perception of an intentional misdeed and feelings of anger can lead to aggression (Averill, 1983).

Anger is likely one factor in the causation of aggression for several reasons. Anger can provide a justification for retaliation and interfere with higher-level cognitive processes inhibiting aggression. Driving anger may be one cause of aggressive driving behaviours such as driving too fast, tailgating, flashing high beams, verbal abuse, physical abuse, and using one's automobile as a weapon (Deffenbacher et al., 1994). Increased levels of anger were related to retaliatory aggressive driving (Roseborough et al., 2011).

Outcome

Retaliatory Aggressive Driving. As discussed earlier, the final focus of the GAM is the outcome or resulting behaviour. Behaviour is a result of inputs and routes (Anderson & Bushman, 2002). In this study, aggressive driving expressed in response to witnessing an unjust driving behaviour was the outcome examined. Driver aggression can take the form of swearing, honking one's horn, tailgating, and even using one's vehicle to damage another driver's vehicle (Deffenbacher, Lynch, Oetting, & Swaim, 2002). Aggression on the road may, or may not, lead to a collision; however, it still creates a dangerous environment for road users. Even the display of milder forms of driving aggression, such as flashing head-lights or obscene gestures can lead to severe confrontations as individuals retaliate back-and-forth and escalate the level of aggressiveness towards each other.

Research Goals

To summarize, the goal of the current study was to examine a model of retaliatory aggressive driving based on the framework of the GAM and possessing a unique justice perspective. The current study is the first to apply and test the attribution-of-blame model of perceptions of injustice in the driving environment. Furthermore, the model of retaliatory aggressive driving examined the potential mediating role of justice sensitivity between belief in

an unjust world and perceptions of injustice and the mediating role of driving anger between perceptions of injustice and retaliatory aggressive driving. While some of the relationships between variables in the model have been identified by prior research (e.g., driving anger and driving aggression), to our knowledge, this is the first study to examine unjust world beliefs, justice sensitivity, driving attitudes in relation to the attribution-of-blame model of perceptions of injustice, driving anger, and retaliatory aggressive driving. To test the hypotheses that unjust world beliefs influence perceptions of injustice via justice sensitivity and perceptions of injustice influence driver aggression via driver anger, a sample of undergraduate students was shown a series of unjust driving scenarios, their responses to which were assessed and analysed.

Method

Participants

Participation was voluntary and course credit was awarded for completing the research study. Data from an initial sample of 327 York University undergraduate students from the Undergraduate Research Participant Pool were collected. To increase confidence in the quality of collected data, nine quality control statements were placed throughout the study questionnaire. There was only one correct response for each statement (e.g., "When you get to the end of this sentence circle *strongly agree*" and "The only way to get this question correct is by circling the *number four*"). It was decided that data from individuals who correctly responded to seven or more statements would be retained for analyses. This decision was based on the fact that the internal consistency (α) of measures was similar to a sample possessing only individuals that answered all nine correctly.

A final sample of 269 participants was used after removing individuals that did not correctly answer seven or more control questions. The sample consisted of 164 women (60.9%).

Participants ranged in age from 17 to 47 years (*M* = 21.6, *SD* = 5.25, *Mdn* = 20). Eighty-six percent of the sample was 25 years of age or younger. Of the entire sample, 171 participants possessed a G2-series license and 98 possessed a G-series license. A G-series license allows drivers to operate any car, van or small truck or combination of vehicle and towed vehicle with certain weight restrictions, but not a motorcycle, bus with passengers, or ambulance. G2-series license holders have the same restrictions as G-series license holders, with additional passenger restrictions. Participants had been licensed drivers for 1 to 27 years (*M* = 4.5, *SD* = 3.78, *Mdn* = 3.3). Participants reported driving an average of 32 (*SD* = 68.3, *Mdn* = 20) kilometres per day and an average of 1.5 (*SD* = 1.34, *Mdn* = 1) hours per day. Approximately 31% of participants primarily drove on major highways (speed limit = 100 km/h), approximately 14% of participants primarily drove on minor highways (speed limit = 80 km/h), and approximately 55% of participants primarily drove on city streets (speed limit = 50 km/h).

Procedure

Participants completed the study during group testing sessions at York University. Group testing sessions were employed to reduce the problematic issues identified by prior research (Roseborough et al., 2011). Roseborough et al. employed an internet study to collect data, although a potential problematic issue is that the researcher has no control over the testing session. Participants could be distracted throughout their testing by television, phone conversations, or other individuals. Another concern of Roseborough et al. regarded the stimuli. Specifically, participants were required to watch animated driving scenarios and answer a series of online questions concerning the scenarios. The animated videos and questions however were stored on separate websites. Roseborough et al. could not determine if participants had watched all videos in their entirety. The use of group testing sessions in a lab allowed researchers to

control the testing environment, ensure participants viewed all stimuli in their entirety, and identify participants that were not participating conscientiously.

The current study began when participants were provided with informed consent, which can be found in Appendix B. Participants were then provided with written scenario prompts, questionnaire booklets, and verbal instructions regarding the manner in which booklets were to be completed. Following the verbal instructions, participants were shown an informational video that identified important features in the videos they were about to view (e.g., different coloured vehicles, changing lights, designated turn-lanes, and high occupancy vehicle lanes). A still frame capture from the informational video is in Figure 4 in Appendix A. Participants were then shown five animated driving scenarios. Before each scenario the written prompt was read aloud by the researcher to ensure all participants knew what would occur in the animated scenario. The animated video was then presented to the participants on a 70-inch high-definition television screen. After viewing each scenario, participants answered questions regarding thoughts, emotions, and behaviours related to the animated scenario. Upon completion of the animated videos, participants completed a second questionnaire booklet that assessed several individual differences and demographic variables. It took students approximately 75 minutes to complete the study. The study was approved for compliance to research ethics protocols by the Human Participants Review Subcommittee (HPRC) of York University.

Measures and Stimuli

Demographic Questionnaire. A demographic questionnaire obtained information regarding the participant's gender, age, region of residence, and driving frequency. These items are in Appendix C.

Unjust World Views Scale (UWVS: Lench & Chang, 2007). This study administered the UWVS to measure the degree to which participants believe the world is unjust in general (i.e., for the self and for others). The UWVS is a 5-item measure. An example item from the UWVS is, "people who do evil things get away with it." Participants rated the degree to which they agreed with each statement using a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The UWVS possessed poor reliability in the current study, exhibiting a Cronbach's alpha value of .58. Previous research has obtained larger Cronbach's alpha values of .72 and .73 (Lench & Chang, 2007; Roseborough et al., 2011). Prior to the study, an additional four items were created with the goal of obtaining a more complete examination of belief in an unjust world. Two items assessed beliefs about the participant's world (e.g., "For me, things do not work out in the end" and "When I am kind to others, they still do not want to be friends with me"). Two items assessed beliefs about other peoples' world (e.g., "People who are kind to others still do not have friends" and "For other people, things generally do not work out in the end"). Reliability analysis indicated the inclusion of these four items increased the internal consistency to an acceptable level, $\alpha = .74$. The complete UWVS and the four additional items are in Appendix D.

Driving Justice Sensitivity Scale. The current study administered a Driving Justice Sensitivity Scale (DJSS). The DJSS was based on the 10-item Justice Sensitivity Scale – Victim (JSS-V: Schmitt et al., 2005), but items were modified to specifically assess sensitivity to injustice in the driving environment. One item from the JSS-V (i.e., "It gets me down when I get fewer opportunities than others to develop my skills") did not appear to transfer to the driving environment and was not modified for the DJSS. The DJSS is a 9-item measure. An example item from the DJSS is, "When I am negatively affected by another driver's carelessness, I have a

hard time forgetting it/letting-go." Participants rated the degree to which each statement reflected their typical reaction using a 6-point scale ranging from 0 (*not at all*) to 5 (*exactly*). The DJSS possessed good reliability in the current study, exhibiting a Cronbach's alpha value of .82. Schmitt and colleague's (2005) Justice Sensitivity Scale – Victims, can be found in Appendix E and the Driving Justice Sensitivity Scale is in Appendix F.

Driving Attitudes Scale. A 10-item driving attitudes measure was developed for this study to measure participants' attitudes toward risky and unjust driving behaviour by drivers in general. Factor Analysis (FA) was used to identify common factors among an original 35 items. Five items were taken from the Young Driver Attitude Scale (YDAS: Malfetti, Rose, DeKorp, & Basch, 1989), and three items that were loosely based on items from the YDAS were created for this study. These items mainly assessed attitudes toward speeding. An example of YDAS item used in the current study is, "If you have good skills, speeding is OK." Thirteen items were taken from driving attitude scales developed by Ulleberg and Rundmo (2002). These items assessed attitudes toward maintaining traffic flow versus rule obedience and joyriding. Two examples of items assessing these attitudes are "It is better to drive smoothly than to always follow the traffic rules", and "Adolescents have a need for fun and excitement in traffic." Ten items were created specifically for the current study and targeted attitudes toward unwritten norms of the road (i.e., driving culture), and traffic law compliance that was not targeted by the other items. Examples of these items include "Taking another driver's parking space is okay if the other driver is too slow", and "Drivers should always use traffic signals when changing lanes or turning." All 35 items are in Appendix G.

Factor Analysis, discussed shortly, suggested a two-factor solution would be appropriate. Only one of the two-factors was not correlated with the other model variables included in the

model and was therefore not included in the final model. The final 10-item measure possessed items related to rule breaking in general, speeding, illegal turns, and not stopping at stop signs (e.g., "Sometimes it is necessary to bend the traffic rules to arrive in time" and "Driving or 'rolling' through a stop-sign is okay if it is safe to do so"). Participants indicated their level of agreement with each statement using a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The complete 13-item measure can be found in Table 1 in Appendix H. Factor 1, the factor used to assess driver attitudes possessed a Cronbach's alpha of .85.

Videos and Questionnaires. Animated videos were used to depict the driving scenarios with the goal of evoking more realistic reactions than those obtained by written descriptions. Furthermore, using only written descriptions of an event requires participants to imagine the event. Participants may imagine different scenarios, influencing the results. The use of animated videos ensures that participants are experiencing the same scenarios. The specific scenarios used were chosen to both support previous research and provide unique insight into driver behaviour. Two of the scenarios (i.e., red-light violation and queuing violation) have been used in previous research and proved to be useful as they evoked injustice related cognitions, emotion, and desires for aggression (Roseborough et al., 2011). The parking violation has also been used as a potentially anger evoking situation in previous research (Deffenbacher, Richards, Filetti, & Lynch, 2005; Wiesenthal et al., 2000). The misuse of an HOV-lane and the risky left-turn are behaviours that have not been examined by the driving research. The inclusion of a parking violation, HOV-lane violation, and the risky left-turn, all of which are relatively unexamined behaviours, provides novel insight into retaliatory aggressive driving. Finally, the scenarios were chosen so that some would depict norm violations and some would depict law violations. The risky-left turn, red-light violation, and HOV-lane violation are all violations of traffic laws.

Although, the improper queuing could be deemed impeding traffic flow, it is most notably a violation of driving norms. The parking violation is also a violation of driving norms. Using norm and law violations permits the identification of differences between the two violation types.

Participants watched five animated video clips depicting an unjust driving behaviour. Scenario 1 depicted a queuing violation, scenario 2 depicted a dangerous turn in front of oncoming traffic, scenario 3 depicted selfish parking behaviour, scenario 4 depicted the misuse of a high-occupancy vehicle lane, and scenario 5 depicted a driver failing to stop at a red-light. Before watching each clip, participants were prompted with a brief written description of the scenario depicted in the video clip. Participants were asked to picture themselves in each scenario, and imagine the thoughts, feelings, and behaviours they would exhibit. The animated clips were created using Autodesk® 3ds Max®, a 3-D modelling, animation, and rendering software. The written prompts and a still frame capture from each animated video can be found in Figure 5 through Figure 9 in Appendix A.

Following each video, participants completed an Attribution, Affect, and Reaction Questionnaire (AARQ)**.** The AARQ is based on a similar measure of attributions, affect and behaviours developed by Roseborough et al. (2011). The measure used in the current study was an expansion of the original measure that included new items that assessed the additional perceptions of injustice attributions. Twenty-six items assessed attributions of violation of entitlement, personal causation, controllability, intentionality, lack of justification, responsibility, and blame, and the perception of injustice. Participants indicated their level of agreement with each item using a 5-point scale ranging from 0 (*completely disagree*) to 4 (*completely agree*). Anger was assessed using a single-item measure (i.e., "how angry would this situation make you feel?") Participants indicated their level of anger using a 5-point scale, ranging from 0 (*not angry*

at all) to 4 (*extremely angry*). Seven items were used to assess participants' likelihood of retaliating in response to the unjust behaviour. Reactions included behaviours such as blocking the offending driver from merging, tailgating, horn honking, displaying rude hand gestures, and swearing at the offending driver. Participants selected the response they would most likely exhibit. Responses were assigned a value with more aggressive behaviours assigned larger values. The retaliatory aggressive driving items can be found in Appendix I.

Results

The current study performed FA and Structural Equation Modelling (SEM). Initially, this study used FA to examine the driving attitude items to identify driving attitude variables. Structural Equation Modelling was then used to examine the overall performance of the model and relationships among the variables.

Sample Size for Analyses

Research has recommended several different sample sizes for adequately conducting FA and SEM. For FA, Hutcheson and Sofroniou (1999) recommended 150 to 300 subjects. Guilford (1954) and Cattell (1978) have recommended sample sizes of 200 and 250, respectively. Comrey and Lee (1992) provided a scale of adequacy, suggesting that sample sizes of 200, 300, and 500, were fair, good, and very good, respectively. Samples of 100 to 200 participants have been recommended for assessing SEM goodness of fit (Hoyle, 1995). Schreiber, Nora, Stage, Barlow, and King (2006) recommend 10 participants per variable in a proposed model. The proposed model possesses 13 observed variables; therefore a sample of 250 was expected to be sufficient. The sample size (274) used in the current study was deemed appropriate for both SEM and FA.

Descriptive Statistics

Belief in an Unjust World. Belief in an unjust world was assessed using the Unjust World Views Scale (Lench & Chang, 2007). Larger scores are indicative of increased endorsement of unjust world beliefs. The mean score for the UWVS was 2.47 (out of a possible 5, *SD* = 0.65). Previous research by Roseborough et al. (2011) and Lench and Chang (2007) obtained similar means and standard deviations: (*M* = 2.56, *SD* = 0.73) and (*M* = 2.57, *SD* = 0.55), respectively. The current study found mean scores for men and women were 2.51 (*SD* = 0.65) and 2.44 (*SD* = 0.65), respectively. There was no significant difference between these means, Welch-*t*(221.02) = 0.77, *p* = .44, Cohen's *d* = .02, 95% CI [-0.10, 0.22]. There was also no significant relationship between UWVS and age, *r* = -.004, *p* = .95, r^2 = .00002.

The mean score for the UWVS-Revised was 2.37 (out of a possible 5, *SD* = 0.58). The current study found mean scores for men and women were 2.44 (*SD* = 0.60) and 2.32 (*SD* = 0.57), respectively. There was no significant difference between these means, Welch-*t*(212.71) = 1.55, *p* = .12, Cohen's *d* = .21, 95% CI [-0.03, 0.26]. There was also no significant relationship between UWVS-Revised and age, *r* = -.05, *p* = .43, r^2 = .003. The Pearson correlation between the UWVS and the UWVS-Revised was *r* = .90, *p* < .001, r^2 = .81. Correlation analyses also identified a significant (*p* < .01) but small (*r* ≈ .20) relationship between UWVS-revised and driving attitudes. Individuals who endorsed increased unjust world beliefs, possessed increased pro-risky/pro-illegal driving attitudes.

Justice Sensitivity. Justice sensitivity was assessed using two measures, the Justice Sensitivity Scale for Victims (Schmitt et al., 2005) and the Driving Justice Sensitivity Scale for Victims developed for this study. Only the DJSS-V was used in the model. The JSS-V was used to compare the mean score and reliability of the DJSS-V.

The mean score for the JSS-V was 2.73 (out of a possible 5, *SD* = 0.95). Larger scores are indicative of increased sensitivity to justice; that is, they were more likely to perceive injustice. Previous research obtained a similar mean of 2.33 for the JSS-V (Schmitt, Baumert, Gollwitzer, & Maes, 2010). The current study found mean scores for men and women of 2.71 (*SD* = 0.86) and 2.74 (*SD* = 1.00), respectively. There was no significant difference between these means, Welch-*t*(243.59) = -0.21, *p* = .83, Cohen's *d* = .03, 95% CI [-0.25, 0.20]. There was a significant relationship between JSS-V and age, with sensitivity decreasing as age increased, *r* = -.15, *p* = .02, r^2 = .02.

The mean score for the DJSS-V was 2.30 (out of a possible 5, *SD* = 1.00). The current study found mean scores for men and women were 2.32 (*SD* = 0.93) and 2.28 (*SD* = 1.04), respectively. There was no significant difference between these means, Welch-*t*(238.61) = 0.30, *p* = .76, Cohen's *d* = .04, 95% CI [-0.20, 0.28]. There was a significant relationship between DJSS-V and age, with driving justice sensitivity decreasing as age increased, *r* = -.18, *p* = .003, r^2 = .03.

As mentioned earlier, the DJSS-V possessed good reliability, α = .82. The JSS-V also possessed good reliability, α = .86. To assess the validity of the DJSS-V, the relationship between the DJSS-V and the JSS-V was examined, and a significant relationship was found, *r* = .57, *p* < .001. The obtained correlation coefficient is indicative of a strong correlation (Cohen, 1988; Hemphill, 2003). The coefficient of determination indicated the two variables possessed 33% shared variance. The strong positive correlation between the two scales is an indication of convergent validity suggesting the DJSS-V is a valid measure of justice sensitivity. To assess the usefulness of the DJSS-V as a measure of justice sensitivity, regression analyses were conducted to determine if the DJSS-V could account for variance in perceptions of injustice over and above

the JSS-V. Five stepwise-regressions were conducted with JSS-V entered in step 1 and DJSS-V entered in step 2. In three of the five regression analyses, JSS-V was a significant predictor of perceptions of injustice when it was the sole predictor. When DJSS-V was entered into the model, JSS-V was no longer a significant predictor. Furthermore, DJSS-V was a significant predictor of perceptions of injustice in all five analyses. The regression data is in Table 2 in Appendix H.

Driving Attitudes. Attitudes toward illegal and risky driving behaviour were assessed using a 10-item scale. Participant scores were calculated using the mean score of the 10-items, and could range between 1 and 5, with larger scores indicative of more positive attitudes toward illegal and risky driving. The mean score for the driving attitude measure was 2.11 (SD = 0.78), suggesting that on average participants had negative attitudes towards illegal or risky driving behaviour. There was a significant difference between men (M = 2.32, SD = 0.78) and women (M = 1.97, SD = 0.71) in their attitude scores, Welch-t(205.81) = 3.75, $p < .001$, Cohen's d = .52, 95% CI [0.17, 0.54]. Males compared to females had more positive attitudes toward illegal or risky driving behaviour. Bivariate correlation analysis indicated the existence of a negative relationship between driving attitudes and age, although it failed to reach significance, r = -.12, p = .052.

Attributions and the Perception of Injustice. The current study measured the perception of injustice as well as attributions proposed to contribute to perceptions of injustice (Mikula, 2003). The medians, means and standard deviations of the attribution items are in Table 3 in Appendix H. The reliability coefficients of the attribution items for all five analyses are in Table 4 in Appendix H. As all of the attribution items were scored on a scale from 0 (*completely disagree*) to 4 (*completely agree*), a score of 2 would denote the midpoint. Scores below 2 would

indicate disagreement with the statement, and scores above 2 would indicate agreement. There were no significant gender differences for any of the attribution variables. There were also no significant relationships between age and any of the attribution variables.

Perception of injustice was assessed using three items that possessed an average Cronbach's $\alpha = .67$ over the five analyses. For all five analyses, mean and median perception of injustice scores were greater than 2, suggesting on average participants felt all five scenarios were unjust. The attribution of causation was assessed using five items that possessed an average Cronbach's $\alpha = .73$ over the five analyses. For all five analyses, mean and median attribution of causation scores were greater than 2, suggesting on average participants felt the behaviours performed in all five scenarios were caused by the red car/offending driver. The attribution of controllability was assessed using four items that possessed an average Cronbach's $\alpha = .65$ over the five analyses. For all five analyses, mean and median attribution of controllability scores were greater than 2, suggesting on average, participants felt the behaviours performed in the five scenarios were under the control of the red car/offending driver. The attribution of intentionality was assessed using four items that possessed an average Cronbach's $\alpha = .76$ over the five analyses. For all five analyses, mean and median attribution of intentionality scores were greater than 2, suggesting on average participants felt the behaviours performed by the red car/offending driver in all five scenarios were intentional. The attribution of lack of justification was assessed using four items that possessed an average Cronbach's $\alpha = .71$ over the five analyses. For all five analyses, mean and median attribution of lack of justification scores were greater than 2, suggesting on average participants felt the behaviours performed by the red car/offending driver in all five scenarios were not justified. The attribution of violation of entitlement was assessed using a single item. For four analyses, mean and median perception of injustice scores were

greater than 2, suggesting four of the behaviours were thought to be a violation of the rights and safety to which drivers were entitled. Participants were ambivalent about the parking violation with mean and median violation of entitlement scores of 1.93 and 2, respectively. The attribution of responsibility was assessed using a single item. For all five analyses, mean and median attribution of responsibility scores were greater than 2, suggesting on average participants believed the red car/offending driver was responsible for the offensive behaviour. The attribution of blame was assessed using a single item. For all five analyses, mean and median attribution of blame scores were greater than 2, suggesting on average participants blamed the red car/offending driver for the offensive behaviour.

Driving Anger. Anger was assessed using a single item measure. Participants indicated how angry each scenario made them using a scale that ranged from 0 (*not angry at all*) to 4 (*extremely angry*). Average anger scores for the five scenarios ranged from 2.70 to 3.31 suggesting that participants were generally angered by the scenarios rather than not. There was no significant difference in reported driving anger between males and females for four of the five scenarios. In response to a red-light runner, males, compared to females, reported more driving anger, Mann-Whitney $U = 7485.0$, $Z = -2.02$, $p = .044$. The Mann-Whitney U statistic was used as it is the appropriate statistical test for comparing two groups assessed with an ordinal measure (Howell, 2007). Table 5 in Appendix H displays the complete set of results of gender comparisons for anger. For Scenario 1 (queuing violation) and Scenario 3 (parking violation) there was a significant negative relationship between age and reported driving anger, with reported driving anger decreasing as participant age increased. Table 6 in Appendix H displays the Spearman rho coefficients for age and driving anger analyses. The Spearman rho statistic was

used as it is appropriate for assessing relationships between variables measured with an ordinal scale (Howell, 2007).

Retaliatory Aggressive Driving. Participants chose from a list of behaviours each of which was assigned a value depending on its degree of severity. Severity ranged from 1 (do nothing) to 7. A score of 7 represented a behaviour involving the use of one's vehicle to perform an aggressive behaviour that changed depending on the scenario (e.g., "Speed up and block the other car from merging" and "Wait for the driver to leave and do something to the vehicle"). Median aggression scores ranged from 4 (i.e., "Give the driver a rude hand gesture") to 5 (i.e., "Honk your horn briefly") for the five scenarios. That is, participants generally responded with a medium level of aggression. Spearman rho correlation analyses indicated there was no significant relationship between driving aggression and age for any of the five scenarios (See Table 6 in Appendix H). Gender differences in retaliatory aggressive driving were present in three of the five scenarios (i.e., queuing violation, left-turn violation, and red-light violation). Males, compared to females, reported they would respond more aggressively in these scenarios. Table 5 contains the results of the gender comparisons for retaliatory aggressive driving.

Factor Analysis

Principal Axis Factoring with Direct Oblimin rotation was performed on 35 items that assessed driver attitudes for a sample of 266 (after listwise deletion) participants. Principal Axis Factoring was chosen over other extraction methods as it is less sensitive to violations of the normality assumption (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Direct Oblimin rotation was chosen as it is an oblique rotation method and allows for factors to be correlated. It was assumed that factors created using the attitude items would be correlated to some degree. Before FA was conducted, univariate outliers were checked via boxplots and histograms, which

indicated that the data were normally distributed. Using an alpha = .001 cut-off level, 20 participants were identified as multivariate outliers and removed from subsequent FA. Items were also assessed for univariate non-normality. In order to assess the attitude items for multicollinearity, tolerance (TOL) and variance inflation factor (VIF) values were examined. Further, data were screened for instances of multicollinearity via analysis of tolerance (TOL) and variance inflation factors (VIF). Multicollinearity was present as several TOL scores were less than .10 (Belsley, Kuh, & Welsch, 1980; Hair, Anderson, Tatham, & Black, 1995). Factorability was assessed using several criteria. First, 15 of the 19 items correlated at least .3 with at least one other item, suggesting reasonable factorability. Second, the Kaiser-Meyer-Olkin measure of sampling adequacy was .86, above the recommended value of .6, and Bartlett's test of sphericity was significant (χ^2 (171) = 1286.52, $p < .001$). One item possessed an anti-image correlation less than .5 and was excluded from the FA. Finally, items were removed until all items possessed a communality (h^2) value greater than .2. Cattell's (1966) method for examining scree plots was used to determine the number of factors to be extracted. Examination of eigenvalues identified three factors with an eigenvalue greater than 1. Examination of the scree plot however, indicated that a two factor solution would be ideal. The two factors accounted for 37.58% of the variance, with the first factor accounting for 30.99%. The item factor loadings and their communalities can be found in Table 1 in Appendix H.

Common Method Variance

An issue of concern for behavioural researchers examining relationships between factors is common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Common method variance is the variance attributable to the method of measurement rather than the actual construct (Podsakoff et al., 2003). The presence of common method variance can threaten the

validity of the conclusions made about the relationships between a study's factors. To determine if common method variance was present in the current study, Harman's single-factor test was performed (Harman, 1967). All variables included in the structural equation models were entered into an exploratory factor analysis. Principal Axis Factoring was used and all variables were forced into one factor. Five factor analyses were conducted, one for each structural equation analysis. For each factor analysis the variance explained by the single factor was assessed. Common Method Variance is considered to be a major problem if the single factor accounts for 50% of the variance in the dataset (Podsakoff & Organ, 1986). The five factor analyses accounted for 23.1%, to 33.1% of the variance in the data set, indicating that Common Method Variance was not a major problem.

Structural Equation Modelling

Structural Equation Modelling was used to assess the structural model of the variables; that is, the relationships between the predictor and outcome variables (Gefen, Straub, & Boudreau, 2000). Weighted least square mean and variance adjusted estimation was used as driving anger and retaliatory aggressive driving were ordinal variables.

There are a number of statistics that can be used to assess model fit. The χ^2 statistic indicates a good model fit if the value was non-significant. The χ^2 statistic however, is influenced by sample size and departures from multivariate normality, and so more importance was ascribed to other fit indices (Schumacker & Lomax, 2004). The Root Mean Square Error of Approximation (RMSEA) indicates how well the model, optimally chosen yet unknown estimates would fit the population's covariance matrix (Byrne, 1998). RMSEA values of .01, .05, and .08 indicate excellent, good, and mediocre model fit, respectively (MacCallum, Browne, & Sugawara, 1996). A confidence interval can also be calculated for the RMSEA statistic. A

confidence interval possessing lower value between zero and .05 and an upper value less than .08 is indicative of good model fit. The Comparative Fit Index (CFI) compares the performance of the proposed model to the performance of the null-model. The CFI performs well with small samples, but is flawed in that it uses the null model as a comparison, which is implausible (Hu & Bentler, 1999; Kline, 2005; Tabachnick & Fidell, 2007). CFI values larger than .95 are recommended, but values from .90 to .95 are acceptable (Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999). Tucker-Lewis Index (TLI) is a variation of the normed fit index (NFI) that analyzes the difference between the chi-square value of the hypothesized model and the chi-square value of the null model. The TLI however, is relatively insensitive to sample size, multivariate non-normality, and estimation method (Hu & Bentler, 1999). TLI values larger than .95 are recommended, but values from .80 to .95 are acceptable. The Weighted Root Mean Square Residual (WRMR) is a variation of the Root Mean Square Residual that quantifies the difference between the residuals of the sample covariance matrix and the hypothesised covariance model. The WRMR is a variation that is recommended for models that possess categorical variables (Yu, 2002). Yu (2002) recommended using a Weighted Root Mean Square Residual (WRMR) value of 0.90 as a cut-off score, with smaller values indicating good model fit. Rather than relying on any one fit index, Hu and Bentler (1999) recommend using a combination of fit indices. For the current study, a model was deemed to have good fit if it possessed a CFI $\geq$ .95, a TLI $\geq$ .90, a WRMR $\leq$ 0.90, and a RMSEA confidence interval possessing a lower value less than .05 and an upper value less than .08.

One final concern of conducting multiple statistical analyses is multiplicity control. Every time a hypothesis test is conducted, four possible outcomes can occur regarding the decision to accept or reject the null hypothesis. Two correct decisions occur when the null hypothesis is true

and is not rejected, and when the null hypothesis is false and is rejected. Two incorrect decisions also exist. These occur when the null hypothesis is true and the null hypothesis is rejected (Type I error), and when the null hypothesis is false and is not rejected (Type II error). To reduce the likelihood of committing a Type I error, each hypothesis test is assigned a nominal error rate or α-level. When multiple hypotheses tests are conducted the individual error rates contribute to a familywise error rate which can become severely inflated. Statistical corrections such as the Bonferroni and Šidák corrections have been developed to adjust the individual hypotheses test error rates while maintaining an acceptable family wise error rate, reducing the likelihood of a Type I error. Corrections such as the Bonferroni however, appear to be overly conservative, and could lead to reduced power and increased Type II error rates (Smith & Cribbie, 2013). Therefore, the current study employed an adjusted Bonferroni procedure developed by Smith and Cribbie (2013) to maintain an acceptable familywise error rate and power. For each SEM, a specific alpha level was calculated as recommended by Smith & Cribbie (2013). The calculated alpha levels ranged from .008 to .011. Model relationships that did not surpass the specific alpha level set per model were not considered significant.

Scenario 1: Queuing Violation. The bivariate correlations for the variables in this analysis can be found in Table 7 in Appendix H. The initial model for severity of retaliatory aggressive driving in response to an individual performing a queuing violation provided a poor fit to the data, $\chi^2(46, N = 254) = 122.65$, $p < .001$ (WRMR = 1.18, CFI = .88, TLI = .83, RMSEA = .08 [CI = .06 to .10]). To account for variance that was not explained by the proposed model, paths were added from intentionality attributions to violation of entitlement attributions, driving anger, and driving aggression, and paths were added from driving justice sensitivity to intentionality attributions, and driving anger. The addition of these paths improved the model fit,

$\chi^2(43, N = 254) = 61.67, p = .032$ (WRMR = 0.73, CFI = .97, TLI = .95, RMSEA = .04 [CI = 0.01 to 0.06]), accounting for 28% of the variability in the severity of retaliatory aggressive driving. This final model can be found in Figure 10 in Appendix A.

Scenario 2: Risky Left-Turn. The bivariate correlations for the variables in this analysis can be found in Table 8 in Appendix H. The initial model for severity of retaliatory aggressive driving in response to an individual turning in front of oncoming vehicles provided a poor fit to the data, $\chi^2(46, N = 259) = 139.73, p < .001$ (WRMR = 1.27, CFI = .86, TLI = .81, RMSEA = .09 [CI = .07 to .11]). To account for variance that was not explained by the proposed model, paths were added from driving justice sensitivity to driving anger, intentionality attributions to violation of entitlement attributions, and causality attributions to violation of entitlement attributions. The addition of these paths improved the model fit, $\chi^2(45, N = 259) = 59.03, p = .08$ (WRMR = 0.71, CFI = .98, TLI = .97, RMSEA = .04 [CI = .00 to .06]), accounting for 38% of the variability in the severity of retaliatory aggressive driving. This final model can be found in Figure 11 in Appendix A.

Scenario 3: Parking Violation. The bivariate correlations for the variables in this analysis can be found in Table 9 in Appendix H. The initial model for severity of retaliatory aggressive driving in response to an individual taking an individual's parking space provided a poor fit to the data, $\chi^2(46, N = 263) = 164.46, p < .001$ (WRMR = 1.35, CFI = .86, TLI = .81, RMSEA = .10 [CI = .08 to .12]). To account for variance that was not explained by the proposed model, paths were added from intentionality to driving anger, driving injustice sensitivity to driving anger, intentionality attributions to violation of entitlement attributions, and causality attributions to violation of entitlement attributions. The addition of these paths increased the model fit, $\chi^2(44, N = 263) = 83.08, p < .001$ (WRMR = 0.88, CFI = .95, TLI = .93, RMSEA =

.06 [CI = 0.04 to 0.08]), accounting for 34% of the variability in the severity of retaliatory aggressive driving. This final model can be found in Figure 12 in Appendix A.

Scenario 4: HOV Lane Violation. The bivariate correlations for the variables in this analysis can be found in Table 10 in Appendix H. The initial model for severity of retaliatory aggressive driving in response to an individual misusing a HOV lane provided a poor fit to the data, $\chi^2(46, N = 255) = 144.89$, $p < .001$ (WRMR = 1.29, CFI = .88, TLI = .84, RMSEA = .09 [CI = .08 to .11]). To account for variance that was not explained by the proposed model, paths were added from intentionality to violation of entitlement, intentionality to driving anger, intentionality to severity of retaliatory aggressive driving, driving injustice sensitivity to intentionality and driving injustice sensitivity to driving anger. The addition of these paths increased the model fit, $\chi^2(43, N = 255) = 60.31$, $p = .042$ (WRMR = 0.70, CFI = .98, TLI = .97, RMSEA = .04 [CI = .01 to .06]), accounting for 30% of the variability in the severity of retaliatory aggressive driving. This final model can be found in Figure 13 in Appendix A.

Scenario 5: Red-Light Violation. The bivariate correlations for the variables in this analysis can be found in Table 11 in Appendix H. The initial model for severity of retaliatory aggressive driving in response to an individual driving through a red-light provided a poor fit to the data, $\chi^2(46, N = 256) = 209.21$, $p < .001$ (WRMR = 1.56, CFI = .76, TLI = .67, RMSEA = .12 [CIs = .10 to .13]). To account for variance that was not explained by the proposed model, paths were added from intentionality attributions to violation of entitlement attributions, driving anger, and severity of retaliatory aggressive driving, from driving justice sensitivity to driving anger and intentionality attributions, and from causation attributions to violation of entitlement attributions. The addition of these paths provided a good model fit, $\chi^2(42, N = 256) = 57.77$, $p = .04$ (WRMR = 0.70, CFI = .98, TLI = .96, RMSEA = .04 [CIs = .01 to .06]), accounting for 24%

of the variability in the severity of retaliatory aggressive driving. This final model can be found in Figure 14 in Appendix A.

Mediation Analyses

The current study proposed two mediated relationships. The first mediated relationship from the belief in an unjust world to the perception of injustice was mediated by driving injustice sensitivity. The second mediated relationship from the perception of injustice to retaliatory aggressive driving was mediated by driving anger.

Several statistical methods have been proposed to identify significant mediating variables (Baron & Kenny, 1986; Preacher & Hayes, 2008; Sobel, 1982). Consider a proposed mediation model in which variable X is proposed to influence variable Y, via variable M. One method, known as the causal steps approach developed by Baron and Kenny (1986), requires the size of the relationships amongst the model to meet certain criteria. Specifically, the relationships between X and M, and M and Y must be significant. Additionally, X must be related to Y, when M is not considered. Finally, when M is included in the model, the relationship between X and Y must fall close to zero. This method is problematic in that each of these relationships is assessed using hypothesis testing, and the implementation of multiple hypothesis tests increases the likelihood of Type I errors and lacks statistical power for testing the indirect effect (Preacher & Hayes, 2008; Hayes, 2009). The causal steps approach is also problematic because it infers the presence of a mediating variable, but does not test the statistical significance of it. The Sobel test (Sobel, 1982) can be used in addition to the Baron and Kenny (1986) method to test the indirect effect from X to Y through M. However, the Sobel test assumes that the sampling distribution of the indirect effect is normal in shape, which it is not, which results in reduced statistical power.

To determine if these mediated relationships were present, this study conducted mediation analyses using bootstrapping as described by Preacher and Hayes (2008). This method is advantageous as it does not require the assumption that the sampling distribution of the indirect effect (*ab* relationship) is normal. Furthermore, by focusing only on the indirect effect (*ab* relationship), the number of inferential tests is minimized compared to the Baron and Kenny method, reducing the overall Type I error rate (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004, 2008; Shrout & Bolger, 2002). The confidence intervals (CI) calculated were bias-controlled (BC) to reduce estimation error and Type I error rates (Efron & Tibshirani, 1993). The bootstrap analyses used 5000 iterations.

Kappa-squared (K^2) is defined as the proportion of the maximum possible indirect effect that could have occurred if constituent effects were as large as the design and data permitted. Values close to 0 imply there is no linear indirect effect, and values close to 1 imply the indirect effect is as large as it can be (Preacher & Kelley, 2011). To assess the size of the effect, Preacher and Kelley (2011) suggest Cohen's (1988) guidelines for assessing r^2 be used with values of .01, .09, and .25 representing defines small, medium, and large effect sizes, respectively.

The mediation results for the indirect effect of belief in an unjust world on perceptions of injustice via driving justice sensitivity for the five scenarios are in Table 12 in Appendix H. Results indicated that the indirect effect was significant for all five scenarios. The K^2-statistic indicated that it was generally a small indirect effect. The mediation results for the indirect effect of perceptions of injustice on retaliatory aggressive driving via driving anger for the five scenarios are in Table 13 in Appendix H. Results indicated that the indirect effect was significant for four of the five scenarios. The K^2-statistic indicated that the effect ranged in size from small to large.

Summary of Results

Although not integral to the current study, the influence of gender and age on other variables was assessed. Gender differences were only identified for driving attitudes, driving anger in response to a red-light violation, and driving aggression in response to a queuing violation, left-turn violation, and a red-light violation. Males had more positive attitudes towards risky or illegal behaviour, increased driving anger, and increased retaliatory aggressive driving. Age was only significantly related to driving justice sensitivity and driving anger in response to a queuing violation and a parking violation. Compared to older drivers, younger drivers were more sensitive to driving injustice, and more angered by a queuing violation and a parking violation. Similar to the gender effects, the influence of age was reduced when included in the model. To maintain model parsimony, age was not included in the model of retaliatory aggressive driving.

SEM indicated that the proposed model of retaliatory aggressive driving did not fit the data well. For all five analyses additional paths were required to increase the model fit to an acceptable level. Only paths that were theoretically meaningful were added. The modified models possessed improved fit for the data and accounted for 24% to 38 % of the variance in retaliatory aggressive driving.

Perceptions of injustice were proposed to comprise of a complex network of attributions. There were significant positive relationships among causality, controllability, and intentionality attributions in all five analyses. The attribution of causality had a significant positive relationship with responsibility attributions in three of the five scenarios. The attribution of controllability had a significant positive relationship with responsibility attributions in two scenarios using the modified alpha level, and a third scenario at an alpha level of .05. The attribution of intentionality has a significant positive relationship with responsibility in all five analyses. In

turn, responsibility attributions and violation of entitlement attributions had significant positive relationships with blame attributions in all five scenarios. Finally, blame and violation of entitlement attributions had significant positive relationships with perceptions of injustice in all five scenarios. Modification indices identified the positive relationships between intentionality and violation of entitlement attributions, and intentionality and controllability attributions in all five scenarios, and between causality and violation of entitlement attributions in three of the five scenarios. Modification indices also identified several relationships involving intentionality attributions. A significant positive relationship from driving justice sensitivity to intentionality attributions was present in two of the scenarios using the modified alpha level, and a fourth scenario at an alpha level of .05. Intentionality attributions had a positive relationship with driving anger in three of the scenarios using the modified alpha level, and a fourth scenario at an alpha level of .05. Finally, intentionality attributions had a positive relationship with retaliatory aggressive driving in two of the scenarios using the modified alpha level, and a third scenario at an alpha level of .05.

The model proposed that individual differences in unjust world beliefs and sensitivity to justice would contribute to perceptions of injustice. Bootstrapping analyses indicated the significant indirect effect of belief in an unjust world on perceptions of injustice via driving justice sensitivity in all five analyses.

The model also proposed an indirect relationship from perceptions of injustice to retaliatory aggressive driving via driving anger. Bootstrapping analyses indicated the presence of this indirect relationship in four of the five scenarios. Additionally, increased severity of retaliatory aggressive driving was predicted by more negative driving attitudes in four of the scenarios using the modified alpha level, and a fifth scenario at an alpha level of .05.

Discussion

The purpose of this study was to provide a better understanding of causal factors of retaliatory aggressive driving in response to a perceived injustice, with the goal of reducing aggressive driving. This study developed and proposed a model of retaliatory aggressive driving based on the GAM. The model proposed that differences in personality and attitudes influence thoughts and feelings that contribute to retaliatory aggressive driving.

General Aggression Model

It is only recently that the driving literature has begun to use the GAM as a framework to provide a better understanding of aggressive driving (Roseborough et al., 2011; Wickens, Wiesenthal, Flora, et al., 2011). The current study proposed a model predicting that belief in an unjust world, sensitivity to injustice, and pro-social driving attitudes would influence the perception of injustice and anger, which would influence retaliatory aggressive driving. The model was partially successful in explaining retaliatory aggressive driving in five unjust driving scenarios. Although the original model did not fit the data well, significant relationships were identified and contributed to a sequence from inputs to routes to outcome. Paths between variables were added in the five analyses producing a good model of retaliatory aggressive driving.

Person Inputs

Person inputs are factors that influence an individual's behaviour via their influence on a person's emotion, cognition, and arousal (Anderson & Bushman, 2002). This study focused on three person inputs related to injustice (i.e., unjust world beliefs, sensitivity to injustice, and perception of injustice) and examined the influence of gender and age.

Age. The driving literature has obtained conflicting results regarding the influence of age on driving related variables (Dahlen et al., 2005; Wickens, Mann, et al., 2011). The current study found that age was only significantly related to driving justice sensitivity and driving anger in response to a queuing violation and a parking violation. Compared to relatively older drivers, younger drivers were more sensitive to driving justice/injustice. It should be noted that 90% of the sample ranged in age from 17 to 28 years old. One possible explanation for this relationship is that over time, drivers become habituated or desensitized to unjust or offensive behaviours (Schmitt et al., 2010). As individuals are repeatedly exposed to a stimulus/event, the resulting physiological response reduces in magnitude (Groves & Thompson, 1970). Research has found that violent video-game players compared to non-violent video-game players experience less physiological arousal in response to real-life violence (Carnagey, Anderson, & Bushman, 2007). Changes in physiological arousal may also be linked to changes in attentional focus. Repeated exposure to anger related words (e.g., enraged, irate) was shown to reduce subsequent attentional focus on such stimuli. Similarly, as a young novice driver becomes an older experienced driver, being cut-off by another vehicle may be viewed as a more common event, reducing the degree of subsequent physiological arousal or attentional focus. Additionally, as a driver spends more time driving, he or she may become accustomed to the social driving norms which may be upsetting if they do not match traffic laws. For example, while a law may say vehicles cannot enter an intersection after traffic lights have turned red, motorists may begin to recognize they can turn with relative safety immediately after the light turns red, and while all intersection traffic lights are red. Such behaviour may become the norm despite it being illegal and potentially unsafe. Drivers who eventually condone the norm will not perceive the behaviour as unjust.

Age also had a significant correlation with anger in response to a queuing violation and a parking violation. Compared to younger individuals, older individuals experienced less anger in response to these violations. Desensitization may also explain the change in emotional response as drivers get older. Additionally, as drivers age they may develop goals that are contradictory to getting angry. For example, the goal of arriving at a destination safely or stress-free may replace the goal of arriving at a destination quickly. Another possible explanation is that the relationship between age and anger is due to a third variable. Neuroticism, which is related to both justice sensitivity (Schmitt et al., 2005) and driving anger (Dahlen & White, 2006), decreases with age (Roberts, Walton, & Viechtbauer, 2006). These potential explanations however, do not explain the differences in scenario results. In three of the scenarios there was no relationship between age and driving anger. Future research could use interviews or diaries and ask individuals why they are angered or not to determine if there are differences in cognitions that account for the relationship between age and anger, and to determine if the relationship is situation specific and related to local driving culture.

Gender. Gender differences were present for several variables. Males, compared to females, had more positive attitudes towards risky or illegal driving behaviour. Prior research has found similar gender differences in driving attitudes. Yagil (1998) found that males, compared to females, had more negative attitudes towards the content of traffic laws. A Canadian study found that compared to females, males believed it was more acceptable to drive while slightly impaired, exceed the speed limit, and drive without wearing a seat-belt (Rothe, 1987). Finally, Ulleberg and Rundmo (2002) found that males had more positive attitudes toward a number of risky driving behaviours including speeding, drunk-driving, and violating traffic laws.

There were also gender differences in severity of retaliatory driving aggression in three of the five studies. Males reported they would react more severely than females in response to a queuing violation, a red light violation, and most notably in response to a risky left-turn. When examined with SEM however, these results were no longer significant. Although the difference between males and females failed to maintain significance in the SEM, the results of the *t*-tests suggest that there may be a third variable involved in the relationship between gender and aggressive driving. As gender differences were not present in all scenarios, the nature of the offensive behaviour may have an influence. Males and females may differ on desired need or degree of punishment for a behaviour, or males and females may differ on the perceived plausibility of a given punishment. As noted, males tend to possess more pro-risky attitudes than females. Therefore, males may be more likely to engage in more aggressive and more risky acts of retaliation.

One possible explanation for gender differences in attitudes and aggressive behaviour is provided by the 'young male syndrome' theory (Wilson & Daly, 1985). Males, particularly younger males compared to females tend to engage in more risky behaviour such as gambling, illicit drug use, drunk-driving, and extreme sports (Anderson, 1999; Byrnes, Miller, & Schafer, 1999). The 'young male syndrome' theory proposes that sexual selection has promoted the evolution of risk taking behaviour in males. While behaviours like drunk-driving may seem to be an undesirable trait, the tendency to engage in risky behaviour may have provided our ancestors with a competitive advantage when attempting to obtain scarce resources (Wilson & Daly, 1985). The gender differences in attitudes towards aggressive/risky behaviour and retaliatory behaviour coincide with the 'young male syndrome' theory.

Belief in an Unjust World. The belief in an unjust world is the belief that bad things happen to good people and good things happen to bad people. Greater endorsement of unjust world beliefs is related to increased perceptions of injustice and anger, and is thought to be linked to negative behaviours. The belief in a just world is the belief that bad things happen to bad people and good things happen to good people. As endorsement of unjust world beliefs increases, endorsement of just world beliefs decreases. In turn, the adaptive functions (e.g., playing down severity of an injustice) provided by just world beliefs also decrease.

The UWVS developed by Lench and Chang (2007) was used to assess participants' degree of belief in an unjust world. Unlike previous research, reliability analyses indicated the scale possessed poor reliability. Conveniently, this study had included additional items with the intention of obtaining a more complete picture of an individual's belief in an unjust world; that is, the belief in an unjust world of one's self and of others. The inclusion of the additional items increased the scale's reliability to an acceptable level. The revised UWVS could provide future research with a more reliable measure of unjust world beliefs, although future research must confirm the reliability and validity of the scale.

The current study predicted and found consistent support for a strong relationship between belief in an unjust world and driving injustice sensitivity (*r*'s = .319 to .340). Schmitt et al. (2005) found similar results between belief in an unjust world and sensitivity to injustice. Schmitt and colleagues (2005) suggested that individuals who are sensitive to injustice perceive more incidents of injustice leading to an increased belief in an unjust world. The proposal that unjust world beliefs are related to sensitivity to injustice is consistent between the current research and that by Schmitt et al. (2005). Results from both studies suggest that reducing endorsement of unjust world beliefs may lead to a reduction in injustice sensitivity.

Correlation analyses also indicated a significant but small relationship between unjust world beliefs and pro-risky/pro-illegal driving attitudes. Although the relationship was not large enough to contribute to the model of aggressive driving, the results suggest a potentially important relationship that should be examined by future research. Believing in an unjust world may allow individuals to develop positive attitudes toward negative behaviour. That is, an individual who believes unjust behaviours will go unpunished would be more likely to possess positive attitudes toward unjust behaviours compared to someone who believes unjust behaviours will result in undesirable consequences. Such a process is supported by the idea that believing in a just world represents a contract between an individual and the social world (Dalbert, 1999; Lerner, 1977).

Driving Justice Sensitivity. This is the first study to examine the influence of sensitivity to injustice in the driving environment. Schmitt et al. (2005) developed a measure to assess an individual's sensitivity to moral norm violation and injustice. The current study developed a version to specifically assess driving injustice sensitivity. Pearson correlation analyses identified consistent positive relationships between driving justice sensitivity and perceptions of injustice (e.g., *r*'s = .219 to .315). Regression analyses were conducted for the five scenarios to determine if the driving justice sensitivity scale could account for additional variance in perception of injustice scores over and above the justice sensitivity scale. Results indicated that the driving justice sensitivity scale predicted a significant amount of variance in perception of injustice scores over the justice sensitivity scale. Additionally, the driving justice sensitivity scale possessed good reliability. These results suggest that the driving justice sensitivity scale is a valuable measure for assessing justice sensitivity in the driving environment. Future research, especially simulation or in-*situ* studies are necessary to provide additional predictive validity.

Driving Attitudes. The current study developed a measure of attitudes towards risky and illegal driving behaviours. Behaviours included speeding and disobeying traffic rules such as stopping at stop signs and performing prohibited turns. The original model proposed that individuals who endorsed attitudes not accepting of risky behaviour would be more likely to perceive said risky or unjust behaviour. Bivariate correlation did not support this proposed relationship. There was however, a consistent significant positive relationship between risky driving attitudes and retaliatory aggressive driving. Individuals who endorsed risky driving attitudes exhibited more severe retaliatory aggressive driving behaviour. Although specific attitudes towards retaliation and hostile behaviour were not assessed, it may be that individuals who possess pro-risky driving attitudes are more likely to possess pro-retaliation attitudes which contributed to retaliatory aggressive behaviour. Additionally, retaliation possesses risk; therefore, pro-risky driving attitudes may contribute to an individual's likelihood of retaliating.

If attitudes for a variety of negative driving behaviours are related, road-safety campaigns attempting to change attitudes towards specific behaviours (i.e., speeding, honing, or drunk driving) may also influence a wider variety of unsafe behaviours. That is changing a specific attitude may prime individuals to change other related attitudes. Future research on safety campaign efficacy should examine the influence of specific attitude change campaigns (e.g., drunk-driving) on a wider variety of unsafe driving behaviours (e.g., speeding, seat-belt usage).

The current study developed a new measure to address attitudes towards driving behaviours. While the current study used items from previous research, it also modified items from previous research and created new items. Modifications were necessary as some items from previous measures would be less useful with the sample used. For example, an item from Malfetti et al. (1989) as cited in Ulleberg and Rundmo (2002) reads, "It is acceptable to drive in

100 km/h road if it is straight and there are no others vehicles in a kilometres distance." As the speed limit on Ontario highways is 100km/h, it would be completely acceptable to drive at this speed. Items such as this were modified to better assess attitudes of the sample. Previous research has also developed scales to assess specific behaviours such as drinking and driving (Malfetti et al., 1989), speeding (Malfetti et al., 1989; Whissell & Bigelow, 2003), and general rule obedience (Ulleberg & Rundmo, 2001). The current study developed new items to assess attitudes towards specific behaviours that have been unassessed by previously developed measures (e.g., disregard for roadway signals and signage, lane violations, and parking violations). A final 10-item measure of driving attitudes was developed. The measure was comprised of several items from Ulleberg and Rundmo's (2001) measure of rule obedience, as well as items assessing speeding and specific rule obedience attitudes. The scale possessed good reliability and was related to unjust world beliefs and was predictive of aggressive driving while controlling for other variables. These results suggest the new measure of driving attitudes would be valuable to research of aggressive driving.

Inputs and Internal States

The GAM states that inputs are features of an individual (e.g., personality, attitudes) or of a situation (e.g., temperature, presence of weapons) that influence an individual's internal state or routes. The current study examined the influence of three inputs (i.e., attitudes, unjust world beliefs, and driving injustice sensitivity) on the perception of injustice, an internal state. Driving anger was an additional internal state included in the model, but no relationships between it and the input variables were proposed.

Driving Attitudes and Perceptions of Injustice. The driving attitudes examined in this study were related to a variety of risky and illegal driving behaviours. This study proposed that

individuals who strongly believed these behaviours were unacceptable would be more likely to perceive similar behaviour as unjust. Although this hypothesis was not supported, there may be attitudes not assessed by the current study that contribute to perceptions of injustice. Rather than examining attitudes related to specific driving behaviour, future studies could examine the influence of attitudes towards the content of traffic laws. For example, individuals may think certain rules are important, but difficult to comply with and thus, may feel the laws are unrealistic resulting in less perceived injustice. Future research could also examine attitudes towards more general aspects of behaviour, such as fairness, courtesy, or safety.

Belief in an Unjust World, Driving Justice Sensitivity and Perceptions of Injustice. This study proposed that driving injustice sensitivity would mediate the relationship between belief in an unjust world and the perception of injustice. Results consistently indicated that individuals who believe in an unjust world are more likely to perceive unjust driving behaviours, due to their increased sensitivity to injustice. Individuals who believe in an unjust world, but who are less sensitive to injustice would be less likely to perceive unjust driving behaviours. These results provide the possibility of reducing perceptions of injustice in the driving environment. As both belief in an unjust world and driving injustice sensitivity are related to perceptions of injustice, reducing said perceptions can be achieved by influencing belief in an unjust world, driving injustice sensitivity, or both. Possible approaches to reduce unjust world beliefs and driving injustice sensitivity are discussed shortly.

Lench and Chang (2007) suggested that belief in an unjust world is unstable and likely to change with new information. Additionally, as belief in an unjust world appears to be related to perceptions of injustice and driving anger, reducing unjust world beliefs could reduce these outcomes as well. Identifying ways to reduce unjust world beliefs and increase just world beliefs

and implementing them in the driving environment could have a positive influence on the driving experience. Unjust world beliefs may increase when people are exposed to injustice (e.g., a rule-breaking motorist going unpunished). Increasing the presence and activity of law enforcement on roadways may reduce unjust world beliefs when road users witness unjust drivers being apprehended more frequently. Additionally, just world beliefs may be increased by rewarding drivers for proper roadway behaviour. Rewards for good behaviour may be perceived as a just event. In Sweden, drivers who obey the speed limit are entered into a lottery from which they can win money funded by fines imposed upon speeders (Haggarty, 2010). While the purpose of this initiative was to reduce speeding, it may also have the additional effect of increasing some drivers' just world beliefs. Ultimately, decreases in unjust world beliefs and increases in just world beliefs could lead to decreases in driving injustice sensitivity and potentially perceptions of injustice.

Recall that Schmitt et al. (1995) proposed that sensitivity to injustice is comprised of four factors: *frequency* of experienced injustice, mental *intrusiveness* of injustice, *punitivity* toward the perpetrator, and intensity of *anger* after injustice. Reducing these four factors should contribute to a reduction in injustice sensitivity and perceptions of injustice. Strategies for reducing the frequency of injustice were mentioned in the discussion of belief in an unjust world. An additional strategy for reducing injustice, that is discussed later, is the reduction of attributions that contribute to perceptions of injustice. Reducing the intensity of mental *intrusiveness* and *punitivity* toward the perpetrator could be the goal of driver education programs. Reducing the mental intrusiveness of injustice could be accomplished by promoting activities that reduce the impact of negative cognitions such as listening to music. Research has found that self-selected music reduces driver stress in response to traffic congestion (Wiesenthal,

Hennessy, & Totten, 2000). Music is believed to relax and distract drivers during undesirable circumstances that result in high traffic congestion and lead to increased attentional demands. Unjust driving behaviours may result in similar increased attentional demands/intrusiveness, which music may help negate. It might be possible to reduce drivers' degree of punitivity towards perpetrators by training them to endorse forgiveness. Promoting forgiveness outside of the driving environment leads to reduced feelings of revenge and increased conciliatory behaviour (McCullough & Worthington, 1995). Finally, reducing anger may be achieved via distractions such as music or cognitive behavioural training similar to that used in anger management programs.

To summarize, the current study found support for a mediated relationship from belief in an unjust world to perceptions of injustice via sensitivity to injustice. Reducing drivers' belief in an unjust world may lead to reduced driving injustice sensitivity, which may lead to reduced perceptions of injustice. If however, reducing belief in an unjust world proved to be difficult, attempts could be made to reduce driving injustice sensitivity via influencing one or several of the four contributing factors. Results from this study suggest that reducing driving injustice sensitivity would lead to a weakening of the relationship between belief in an unjust world and perceptions of injustice.

In addition to the perception of injustice, driving justice sensitivity had a significant relationship ($p < .01$) with intentionality attributions in two of the scenarios, and significant at the .05 level in a third. Individuals, who were more sensitive to driving justice, attributed increased intentionality to other driver's behaviour. This is not overly surprising as intentionality attributions are a key component of perceptions of injustice (Roseborough et al., 2011; Wickens, Wiesenthal, Flora, et al., 2011). While the results of this study are not conclusive, they suggest

that driving justice sensitivity is an important individual difference that contributes to intentionality attributions, a core attribution of perceptions of injustice. The potential importance of this relationship is further understood when the influences of intentionality attributions, which will be discussed shortly, are considered.

Driving Justice Sensitivity and Driving Anger. Results suggested that the addition of a path from driving injustice sensitivity to driving anger would explain additional variation in the data. There was a significant relationship between driving injustice sensitivity and driving anger in all five analyses (B = .30 to .42). Finally, increased driving justice sensitivity was related to increased driving anger in all five scenarios. This finding is consistent with prior research on justice sensitivity and anger (Schmitt et al., 1995).

The relationships between driving justice sensitivity and the perception of injustice, intentionality attributions and driving anger provide potential opportunities for intervention. Reducing driver sensitivity to justice should reduce perceptions of injustice, intentionality attributions and driving anger. As mentioned earlier, sensitivity to injustice results from experiencing unjust events. Therefore, reducing the number of unjust events on the road may reduce driving justice sensitivity. Unjust events can be reduced by punishing drivers who disobey laws or norms, and rewarding drivers who abide by laws and norms. This is the first study to examine the influence of justice sensitivity on cognitions, affect and behaviour in the driving environment. Results suggest that an individual's sensitivity to driving injustice plays an important role in increasing negative emotions which contribute to retaliatory aggressive driving.

Internal States

Perceptions of Injustice. Research by Roseborough et al. (2011) examined the perception of injustice and attributions that contribute to said perception. This prior research

however, used single item measures to assess the attributions and perception of injustice. Single-item measures are sufficient for assessing factors when the factor is uniformly imagined (Rossiter, 2002). An additional benefit of single-item measures is that it allows for the measurement of increased constructs while reducing test length and participant fatigue. Single-item measures however, may lack predictive and construct validity (Bergkvist & Rossiter, 2007; Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). The current study aimed to extended prior research and created multiple item measures of several injustice related attributions based on items developed by Mikula (2003). Multiple-item measures can potentially provide researchers with more information than single-item measures. Multiple-item measures can address multiple facets of a particular factor and can allow for increased distinction between individuals due to the increased potential for score variability (Baumgartner & Homburg 1996; Churchill 1979). The attribution and perception measures developed for this study possessed questionable (e.g., $\alpha = .65$) to adequate reliability (e.g., $\alpha = .76$) (George & Mallery, 2003). The measures however, possessed anywhere from three to five items. The number of items in a scale is a factor that can influence reliability (Levine & Parkinson, 1994). Increasing the number of items deemed to have face validity and content validity when conducting future research could increase the scale reliability. The use of focus groups is one method that could be used to obtain additional items for assessing perception of injustice attributions (Nassar-McMillan, Wyer, Oliver-Hoyo, & Ryder-Burge, 2010). Despite the lower scale reliabilities, the results obtained by the current study were similar to previous research (Mikula, 2003; Roseborough et al., 2011).

Although one goal of this study was to develop more valid measures of the attributions of injustice proposed by Mikula (2003) by increasing the number of items, the second goal was to examine the relationships among the constructs and their influence on perceptions of injustice in

the driving environment. Mikula (1993) theorized that whether or not an individual perceives an event as unjust is dependent on attributions he/she makes regarding characteristics of the event. Mikula (2003) proposed that perceptions of injustice are comprised of attributions of violation of entitlement and blame. Mikula (2003) further proposed that blame is comprised of attributions of lack of justification and responsibility. Furthermore, responsibility is proposed to be comprised of attributions of causation, controllability, and intentionality (Mikula, 2003). This study incorporated Mikula's model of injustice, although lack of justification attributions were removed from the analyses to maintain model parsimony.

The five path analyses found consistent relationships amongst attributions of causation, controllability, and intentionality. If a motorist was believed to have caused the offensive behaviour, he/she was believed to have control, with the offensive behaviour seen as intentional. These relationships lend support to prior attribution and aggressive driving research (Roseborough et al., 2011). Controllability attributions were significant predictors of responsibility attributions in three of the five scenarios. Intentionality attributions were significant predictors of responsibility attributions in four of the five scenarios. Causality attributions were significant predictors of responsibility attributions in three of the five scenarios. The more an offender was believed to be the cause of the offense, in control of the offense, and intended to offend, the more likely the offender was believed to be responsible for the unjust driving behaviour. One explanation for the inconsistent results is that in a given scenario, one attribution (e.g., controllability) may account for the variance in responsibility attributions more effectively than another attribution (e.g., causality). Another explanation is that in a given scenario an attribution proposed to be related to responsibility, might be related to an alternative attribution. For example, in the two scenarios in which causality attributions were not predictive

of responsibility attributions, they were significant predictors of violation of entitlement attributions.

Supportive of Mikula (2003), the current study found consistent support for a strong relationship (*B*'s = .63 to .79) between responsibility attributions and blame attributions. Attributions of violations of entitlement were also consistently related to attributions of blame (*B*'s = .22 to .48). The more an offender was believed to be responsible for a driving behaviour, and the more the behaviour was identified as a violation of the participant's safety and rights, the more blame was assigned to the offending driver.

The final steps in the model of injustice perceptions proposed by Mikula (2003) are the contributions of blame attributions and violation of entitlement attributions to the perception of injustice. There was consistent support for the relationships between blame attributions and the perception of justice (*B*'s = .24 to .49) and violation of entitlement attributions and the perception of injustice (*B*'s = .34 to .56). Perceiving injustice appears to be dependent on (1) identifying the target that committed the injustice and (2) perceiving that the event experienced was not deserved or expected given the circumstances. For example, a driver who does not give way at an intersection with malfunctioning lights is more likely to be expected and thus permitted, than a driver who does not give way at an intersection equipped with stop-signs or a roundabout.

Although not proposed by the original model of retaliatory aggressive driving, SEM analyses identified a relationship between intentionality attributions to violation of entitlement attributions in all five scenarios. A significant relationship from causality attributions to violation of entitlement attributions was identified in three of the five scenarios. Both of these relationships are supported by previous research (Roseborough et al., 2011). These results

suggest that violations of one's entitlement to rights, safety, or courtesy, are less likely to occur if drivers perceive behaviours to be unintentional. Training drivers to perceive offensive behaviours as accidental could influence violation of entitlement attributions. Research however, should be conducted to examine the influence of attributions of carelessness or negligence on anger. While a driver may accidentally swerve in front of you, the fact that the driver was searching for something in the glove box and not focused on driving may anger you.

The current study found consistent support for Mikula's (2003) model of perceptions of injustice. The results provide information regarding perceptions of injustice, as well as information on how to reduce perceptions of injustice. Recent research on attribution training found that individuals trained to think of positive causes (e.g., accidental causes) of an outcome rather than negative causes (e.g., intentional causes) of an outcome led to reduced self-reported anger during an insulting situation (Hawkins & Cougle, 2013). Training drivers to modify attributions of causation, intentionality, or responsibility may influence the frequency of perceptions of injustice. Racial stereotyping research has found individuals who have undergone attribution training are less likely to make negative attributions towards other individuals (Stewart, Latu, Kawakami, & Myers, 2010). Specifically, white individuals were more likely to attribute situational over dispositional explanations for negative stereotype-consistent behaviors performed by black men after training.

Internal States and Outcome

The GAM states that internal states influence an individual's behaviour. The current study examined influence of two internal states (i.e., perceptions of injustice and driving anger) on the severity of retaliatory aggressive driving.

Perceptions of Injustice, Driving Anger, Retaliatory Aggressive Driving. In the current study, the perception of injustice was a significant predictor of driving anger in all five analyses (*B*'s = .38 to .67). These results are is consistent with prior injustice, anger and aggression research (Averill, 1983; Mikula, 1993; Weiss, Suckow, & Cropanzano, 1999). Previous driving research used a latent variable to represent perceptions of injustice and obtained similar, but inconsistent results regarding the relationship between perceptions of injustice and driving anger (Roseborough et al., 2011). The use of an exogenous variable in the current study suggests there is a more consistent relationship between the perception of injustice in the driving environment and driving anger. Events that were perceived as more unjust tended to evoke more driver anger. While the relationship between injustice and anger appears to be a consistent phenomenon, future research should investigate what aspects of an unjust event contribute most to anger. It may be the threat of physical or psychological harm of an unjust event, the staunch disrespect for social norms, or even a form of jealousy that contributes to anger (Miller, 2001; Solomon, 1990). For example, seeing a motorist use a high-occupancy vehicle lane illegally and unpunished may evoke anger in individuals who believe they would be punished for engaging in the same behaviour. Understanding the cognitive link between perceptions of injustice and anger provides a potential intervention opportunity. If individuals perceive injustice as a threat to their well-being, reducing the severity of this belief may be one way to reduce their anger. Similarly, providing well-behaved motorists with the belief that unjust motorists will be eventually be punished for their behaviour may reduce the envy of engaging in unjust driving behaviour.

Driving anger was related to the severity of retaliatory aggressive driving in all five unjust driving behaviour scenarios (*B*'s = .27 to .61), which is consistent with similar research that examined the likelihood of aggressive driving behaviour (Dahlen et al., 2005; Roseborough

et al., 2011). While prior research has examined the likelihood of aggressive responses, this study has provided insight into anger's influence on the severity of responses. As reported driving anger in response to an unjust event increased, so too did the severity of retaliatory aggressive driving. The results of this study contribute to the understanding of aggressive driving. Although there is fairly strong relationship between driving anger and the likelihood and severity of aggressive driving responses, few studies have examined the mediating variables that help maintain this relationship (Lennon & Watson, 2011). Two motivations that contribute to retaliatory aggressive driving are the desire to inform an offender his or her behaviour was unacceptable, and to go gain retribution (e.g., an eye-for-an-eye, one's pound of flesh). Additionally, the justice literature has identified the potential influence of numerous factors that can influence reactions to injustice including apologies, third-party reactions, in-group/out-group status, and the presence of an audience (Miller, 2001). Future research should aim to identify the factors that mediate the relationship between driving anger and retaliatory aggressive driving. Mediating variables could be used to reduce the influence of driving anger on retaliatory aggressive driving. If apologies were significantly contributed to reduced retaliation, driver education programs could promote the importance of apologizing for offensive driving behaviours.

The proposed model of retaliatory aggressive driving also hypothesized the presence of an indirect relationship between perceptions of injustice and retaliatory aggressive driving. In three of the five scenarios, mediation analyses indicated that the perception of injustice had a significant influence on retaliation via its influence on driving anger. This relationship was significant in a fourth scenario at the .05-level. These mediation results are important as they suggest the possibility of influential interventions. Reducing perceptions of injustice while

driving may lead to reduced driving anger that will lead to reduced retaliatory aggressive driving. Driving aggression could also be reduced by targeting driving anger. Driver training programs could provide new and experienced drivers with adaptive coping strategies to reduce or negate experienced driving anger. As mentioned earlier, evidence supports the use of music in reducing the anxiety caused by cognitively overwhelming situations by acting as a distraction (Wiesenthal, Hennessy, & Totten, 2000). Similarly, music could be used to reduce the negative cognitions resulting from an unjust event that contribute to driving anger. Techniques borrowed from cognitive behavioural therapy such as cognitive restructuring, relaxation and breathing exercises, or stress inoculation may reduce driving anger may also provide effective means for reducing driver anger.

In addition to the complex relationship between perceptions of injustice, driving anger, and retaliatory aggressive driving, results identified two significant relationships from intentionality attributions (i.e., a contributor to perceptions of injustice) to driving anger, and from intentionality attributions to retaliatory aggressive driving. The results suggest that the more intentional an offender's behaviour was believed to be, the more anger was reported by the victimized driver. Additionally, the more intentional an offender's behaviour was believed to be, the more severe the retaliation. There is evidence to suggest a cognitive link between intentionality attributions and retaliatory aggressive driving. Galovski and Blanchard (2005) proposed that intent is an integral factor in discriminating aggressive driving from driving error or lapses in judgment. As noted before, Lennon and Watson (2011) found that individuals who believed aggression was intentional, also believed retaliation was justified.

As discussed earlier, driving justice sensitivity (i.e., an input variable) had a significant relationship with intentionality attributions. Furthermore, intentionality attributions were related

to responsibility and violation of entitlement attributions. Similar research has also found the significant influence of intentionality attributions (Lustman et al., 2010; Wickens, Wiesenthal, Flora, et al., 2011). As a whole, these results suggest that attributions of intentionality have an integral role in retaliatory aggressive driving. The results also suggest multiple avenues for reducing the severity of retaliatory aggressive driving. One avenue involves using driver training programs and attribution training to train drivers to make attributions that do not contribute to perceptions of injustice. Most notably, training programs could focus on intentionally attributions, training drivers to search for environmental factors of offensive behaviour that promotes perceptions of accidental behaviour rather than intentional behaviour. Similarly, training drivers to perceive a positive goal of an offender's behaviour rather than a negative goal may influence intentionality attributions. For example, the perception that a driver intended to cut *you* off (i.e., negative goal) may evoke more anger and aggression than the perception that a driver intended to change lanes (i.e., positive goal) and failed to see your vehicle.

Limitations and Future Directions

One limitation of the current study was the restricted age range of the participants. While the sample ranged from 18 to 47 years of age, 50% of the sample was sample was 20 years of age or younger, and 86% was below the age of 25 years. Research has identified that driver age can influence emotional and behavioural response to offensive driving behaviour. As driver age increases the degree of experienced anger in response to an experienced offensive driving behaviours decreases (Parker et al., 2002). Additionally, increases in driver age are related to reductions in aggressive driving behaviour (Wickens, Mann, et al., 2011). The current study found limited influence of age on variables included in the model. The strongest relationship was between age and driving justice sensitivity. There was a weaker and less consistent relationship

between age and driving anger. Interestingly, the change in driving justice sensitivity was significant using the limited age range, suggesting a more rapid change compared to changes in driving anger. Future research should identify the factors that contribute to changes in sensitivity, with the goal of increasing the speed of change. Future research should also identify the factors that contribute to changes in driving anger over the lifespan. As the change in driving anger appears to take a longer amount of time, speeding up the process should be a goal of road safety professionals.

Another limitation of the current study was its reliance on pen-and-paper questionnaires. There several advantages to using self-report pen-and-paper studies, including the collection of a large amount of data from a large number of participants relatively quickly and with low cost (Goodwin, 2009). These advantages however, are threatened by the potential disadvantages of self-report pen-and-paper studies, including social desirability, lack of predictive validity, and the lack of realism. Several studies have examined the disadvantages of self-report driving behaviour measures. Lajunen and Summala (2003) examined the influence of social desirability on a measure of driving behaviour that asks participants to indicate how frequently they commit undesirable driving behaviours. Social desirability is more likely to occur when undesirable rather than desirable behaviours are reported, resulting in an under-reporting of undesirable behaviours (Lindeman & Verkasalo, 1994). Participants were either applying to a driver training program who completed the questionnaire in front of an instructor or students in the training program who completed the questionnaire in private. Participants who were applying to the training should have provided the more socially desirable responses. Of 28 behaviours, only 6 differed between the two conditions; differences that were generally small. These results suggested that even when there were benefits of embellishing answers (i.e., admittance to the

training program), social desirability had minimal influence on self-report measures of driver behaviour. Another potential disadvantage of pen-and-paper driving research is that laboratory studies lack the realism of reality. For example, driver may experience greater emotion in response to an actual unjust driving behaviour compared to emotion experienced when reading about the same behaviour. This study employed the use of animated scenarios with the goal of evoking more realistic cognitions, emotions.

A final limitation of this study was that it did not employ a longitudinal research design. As noted throughout this study, several of the variables (e.g., UWVS and driving justice sensitivity) are dynamic and influenced by events we encounter while driving. Future research could inquire about a driver's driving history, but this methodology possesses certain memory biases (Goodwin, 2009). Employing a longitudinal research design would allow for an examination of how unjust and just driving events contribute to changes in individual differences, cognitions, emotions, and ultimately behaviour. Additionally, receiving real-time information regarding a driver's experiences should reduce the influences of memory biases.

One final avenue for future research has been touched upon throughout this study, implementation and assessment of driver training programs. The goal of this study was to obtain a more complete understanding of aggressive driving, with the intention of integrating the results into future driver training programs. An ideal opportunity to examine the influence of driver training programs would be during future in-*situ* research. Participants could be placed in experimental conditions represented by different intervention strategies or training to combat driving anger or reduce unjust world beliefs.

Research results suggest that providing drivers with positive coping behaviours such as listening to music may help reduce anger in stressful and agitating driving situations (Wiesenthal, Hennessy, & Totten, 2000; 2003). Research has also examined the effects of muscle relaxation

and breathing exercises and found that such exercises led to reductions in the frequency of day-to-day driving anger (Deffenbacher, Filetti, Lynch, Dahlen, & Oetting, 2002). The same study also examined cognitive-behavioural/attribution training in which individuals identified non-anger evoking causes of driving situations for one-hour a week over an eight week period. This cognitive training led to reduced frequency of anger in day-to-day driving and reduced hostile/aggressive expression at a one-month follow-up. The cognitive training also led to increases in adaptive and constructive behaviours, such has turning on the radio and thinking of positive ways to react.

Driver education programs could aim to increase driver's endorsement of just world beliefs by providing evidence of a just world to reduce unjust world beliefs. Evidence of a just world would include information regarding the efficacy of police enforcement (e.g., success of red-light cameras, or anti-street racing campaigns) or information about the negative consequences of bad driving behaviour (i.e., collision data, or psychological effects on other motorists). Information could also be provided that highlights the positive consequences of good behaviour such as stress-free driving experiences for everyone, or rewards from reward programs, if developed. As mentioned earlier, an anti-speeding program in Sweden fines drivers that speeder and rewards drivers that do not speed (Haggarty, 2010).

After completing the training, participants could complete the in-*situ* study. Furthermore, the use of longitudinal in-*situ* studies could identify the influence of prolonged training. In-*situ* methodology also combats the disadvantage of realism which may hinder pen-and-paper studies as the consequences of behaviour in-*situ* are real. That is, in a questionnaire study, a participant may report he/she would react aggressively; however when in a vehicle, faced with potential injury or vehicle damage, he/she does not react aggressively.

Conclusion

The goal of this study was to provide a better understanding of retaliatory aggressive driving in response to a variety of unjust driving behaviours. The justice-related variables examined in this study have seldom or never been examined in regards to driving anger and driving aggression. In line with the GAM, the current study found a significant path leading from individual differences (i.e., belief in an unjust world and driving injustice sensitivity), to internal states (i.e., perceptions of injustice and anger), to retaliatory aggressive driving. Results of this study identified several consistent relationships (i.e., belief in an unjust world to driving injustice sensitivity to perceptions of injustice, driving attitudes to retaliatory aggressive driving), which may be generalized to other driving situations. The results also identified relationships that may be situation specific (i.e., intentionality attributions to retaliatory aggressive driving). In addition to the model of retaliatory aggressive driving, the current study developed a useful measure for assessing driving justice sensitivity. Reliable measures of driving attitudes and unjust world beliefs were also created, and require future research for further validation. The current study has provided important information about previously unexamined variables and driving aggression. The pathway identified in this study should be examined using in-situ driving behaviour research. Results from the current study provide support for possible intervention strategies that can be employed by driving education programs to reduce aggressive driving, creating a safer driving environment.

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Appendix A

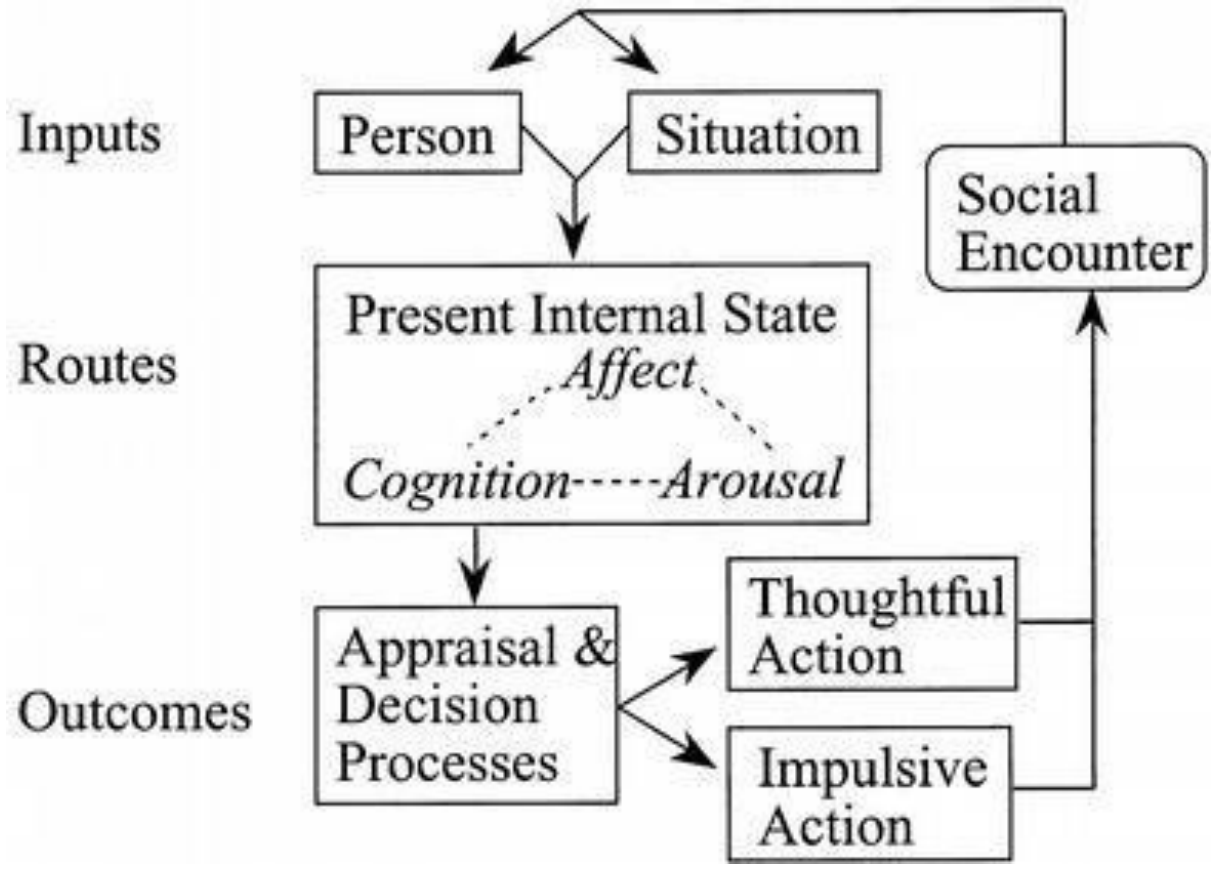

Figure 1. The General Aggression Model proposed by Anderson and Bushman (2002).

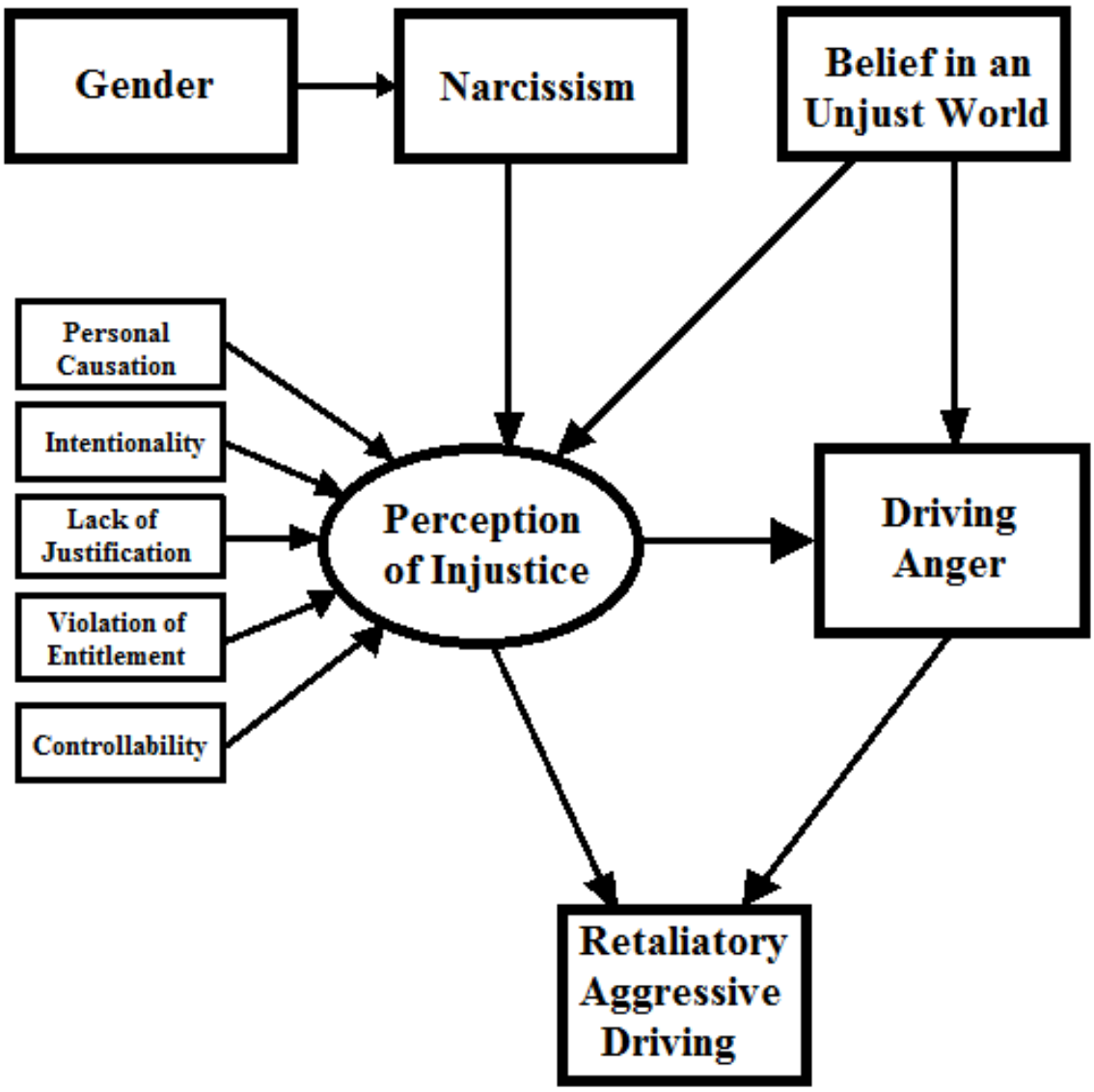

Figure 2. Original model of retaliatory aggressive driving proposed by Roseborough, Wiesenthal, Flett, and Cribbie (2011).

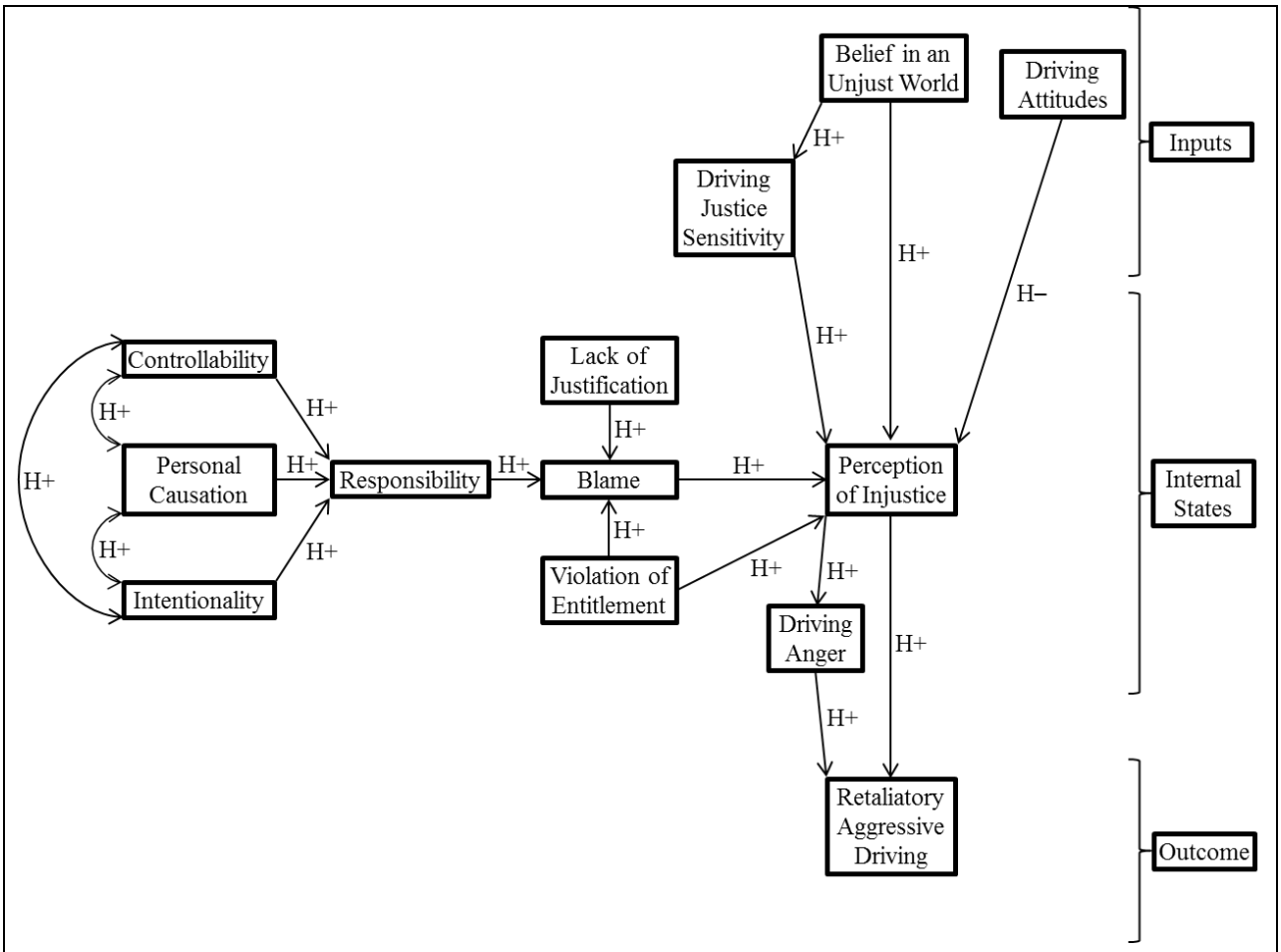

Figure 3. Model of retaliatory aggressive driving proposed by the current study.

Note. H+ = proposed positive relationship. H- = proposed negative relationship.

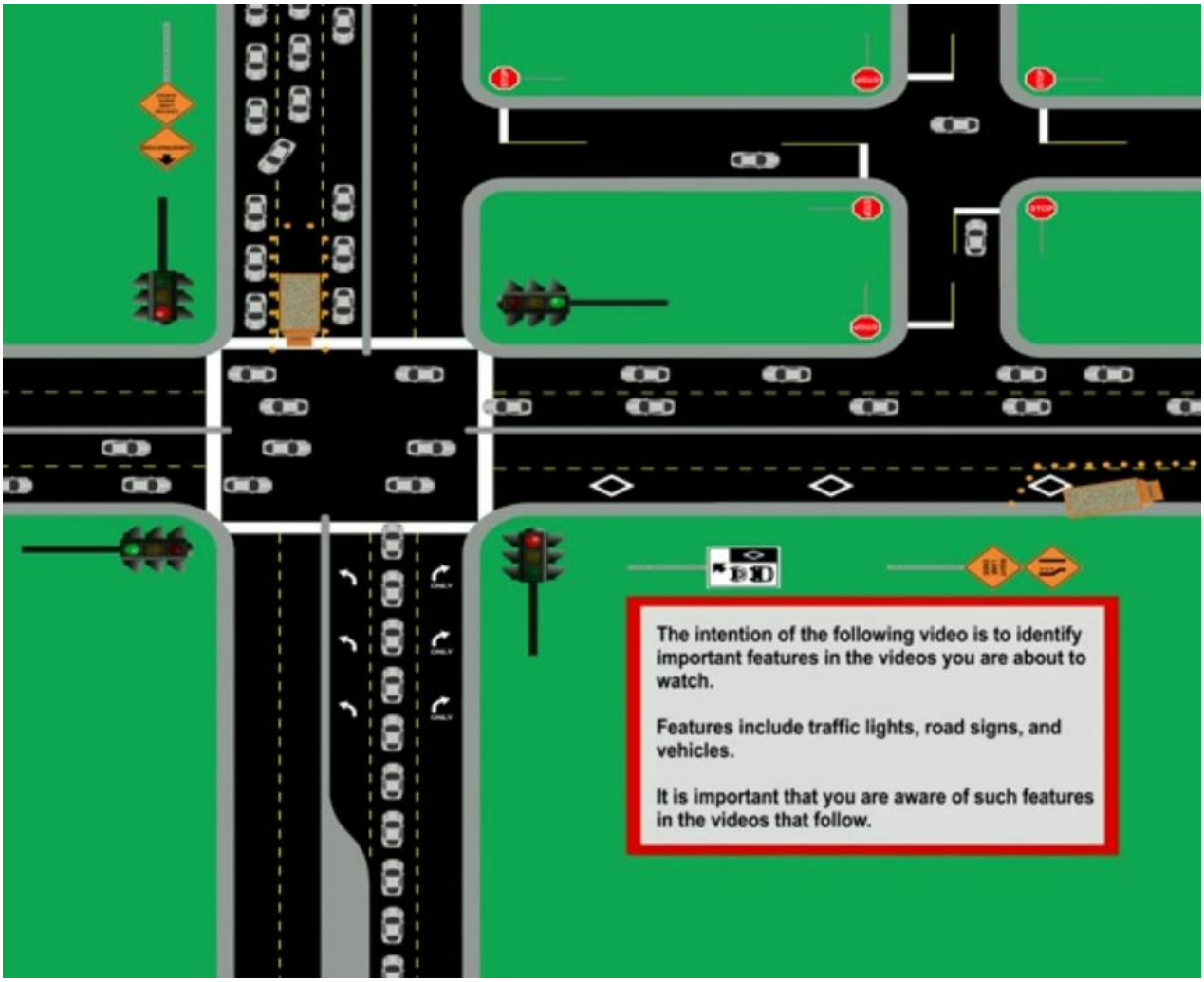

Figure 4. Video screenshot from the instructional video.

Prompt: You are travelling North in your green car. You are in the designated left-turn lane. Traffic is moving well in the other northbound lanes, but you have been waiting a while as there are a lot of vehicles waiting to turn left. As you near the intersection, in your side mirror you notice a red car travelling in the Northbound centre lane. As the red car arrives at the intersection, it begins to merge into the left-turn lane ahead of your vehicle.

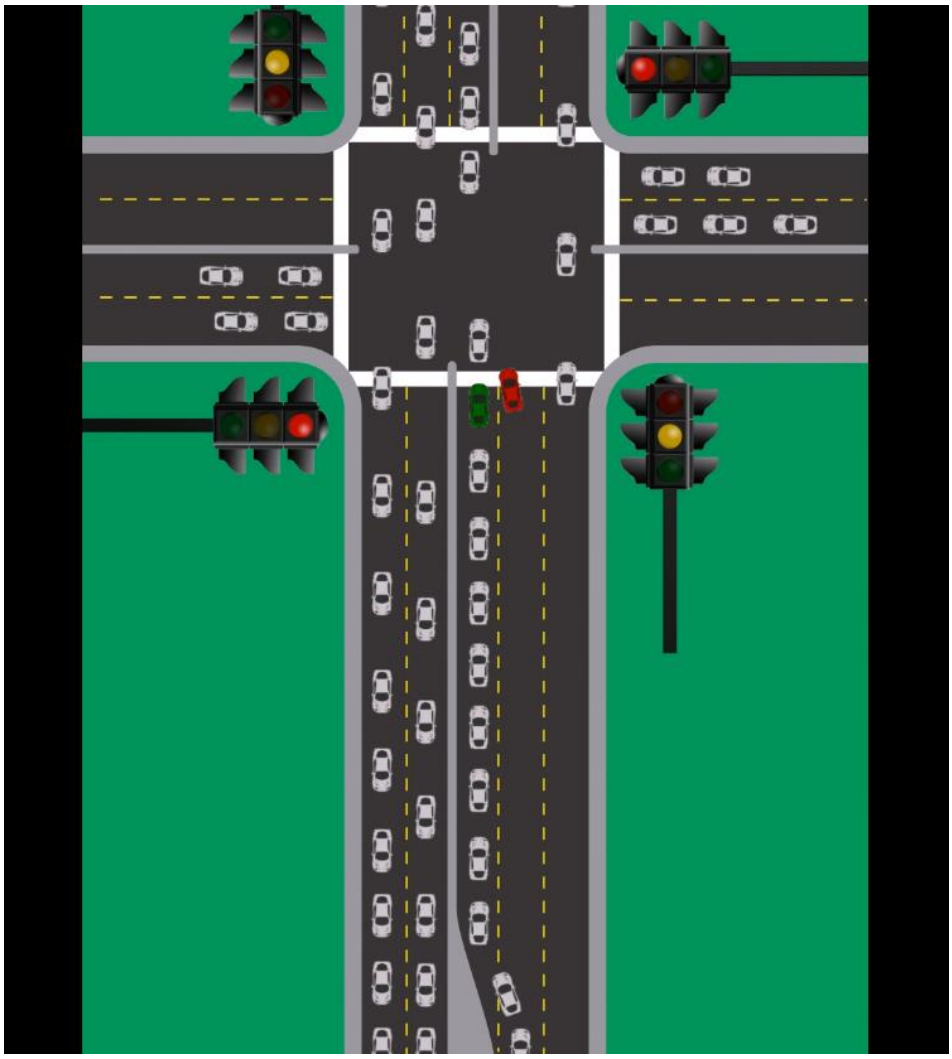

Figure 5. Prompt and video screenshot from the unjust driving scenario 1, depicting a queuing violation.

Prompt: You are travelling North on a 2-lane road in you green car. You are driving in the right lane and at the upcoming intersection you plan on turning right. The lights at the intersection turn red and you come to a stop. Signs indicate that right-turns are not allowed on a red light; so you must wait until the light turns green. East/West traffic moves through the intersection and eventually comes to a stop as their light turns red. While all the traffic lights are red, a red vehicle travelling South begins to creep into the intersection. When the North/South light turns green, the red vehicle quickly turns left in front of the Northbound cars. You must stop your right-turn to avoid a collision with the red car.

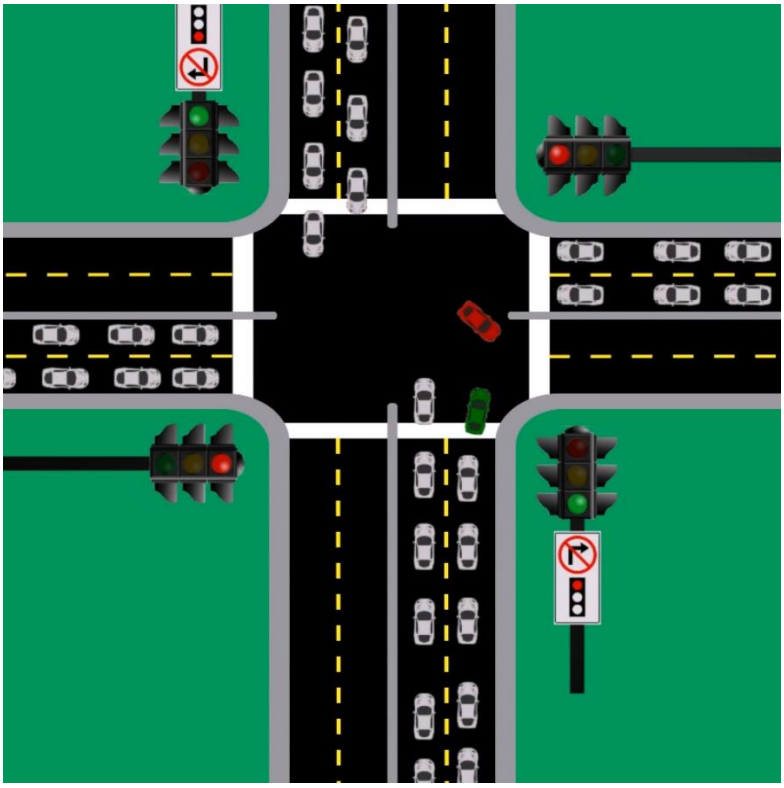

Figure 6. Prompt and video screenshot from the unjust driving scenario 2, depicting a risky left-turn.

Prompt: You are driving your green car in a busy mall parking lot. You have been searching for an empty space for a while, but have not been able to find one. You then see a person walking to their yellow car. You drive towards their vehicle, turn on your turn-indicator, and stop. As the yellow car exits the parking space you must back up to provide more room for the yellow car. While the yellow car backs out, a red vehicle driving West in another row nears the space and parks.

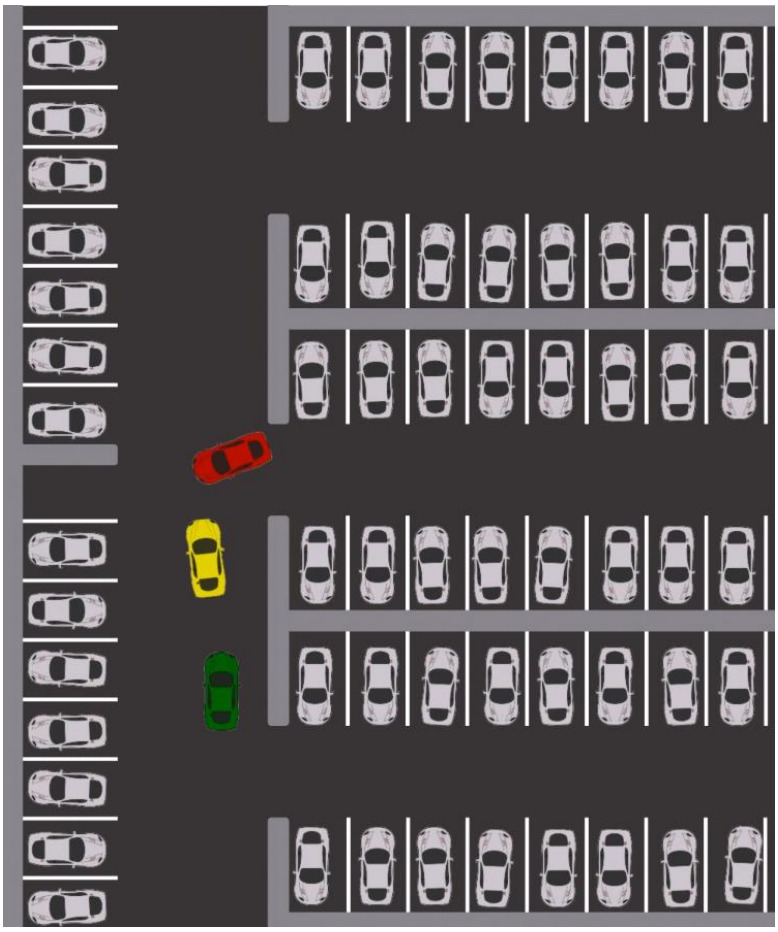

Figure 7. Prompt and video screenshot from the unjust driving scenario 3, depicting a parking violation.

Prompt: You are travelling North in your green car through traffic congestion. You are approaching an intersection in the middle lane of a 3-lane road. To your right is a high-occupancy vehicle (HOV) lane, where only busses and vehicles with 3 or more occupants are permitted. As you get close to the intersection traffic slows and you must stop. To your right, a bus travelling North drives through the intersection and makes its routine stop. In the HOV lane, behind the bus, is a red car with a single occupant. Traffic begins to move and you drive through the intersection. The red car also drives through the intersection and as it gets close to the stopped bus it tries to merge into your lane, in front of your vehicle.

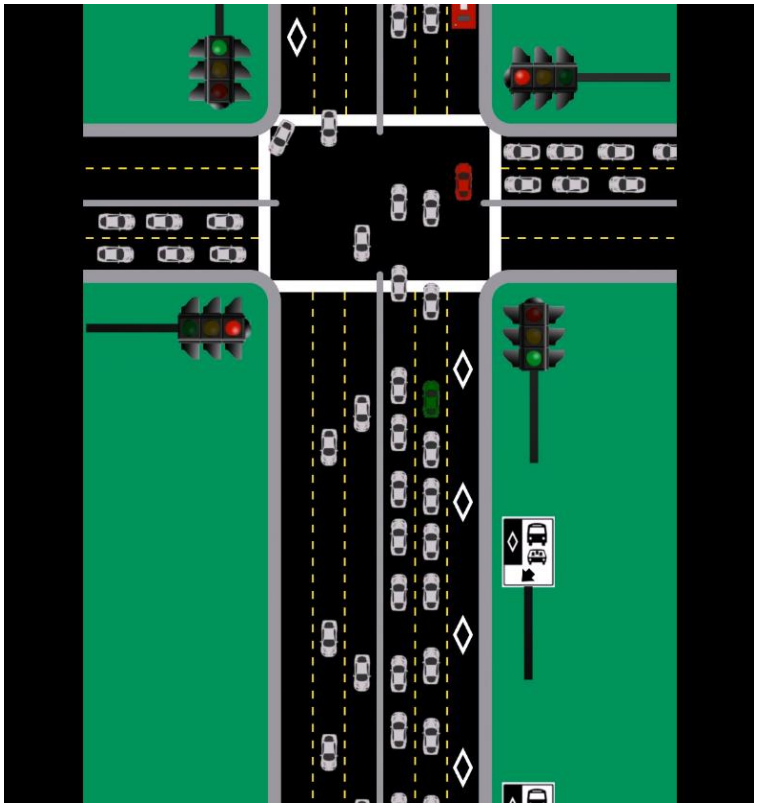

Figure 8. Prompt and video screenshot from the unjust driving scenario 4, depicting a high-occupancy vehicle lane violation.

Prompt: You are travelling North in the far right lane in your green car. You approach an amber light and as it turns red, you stop. You turn on your right-turn indicator. The light for East/West traffic turn green and the cars begin to move. Eventually the light for East/West traffic turns amber and then red. As you begin to turn right, a red car travelling East drives through the intersection and narrowly misses your vehicle.

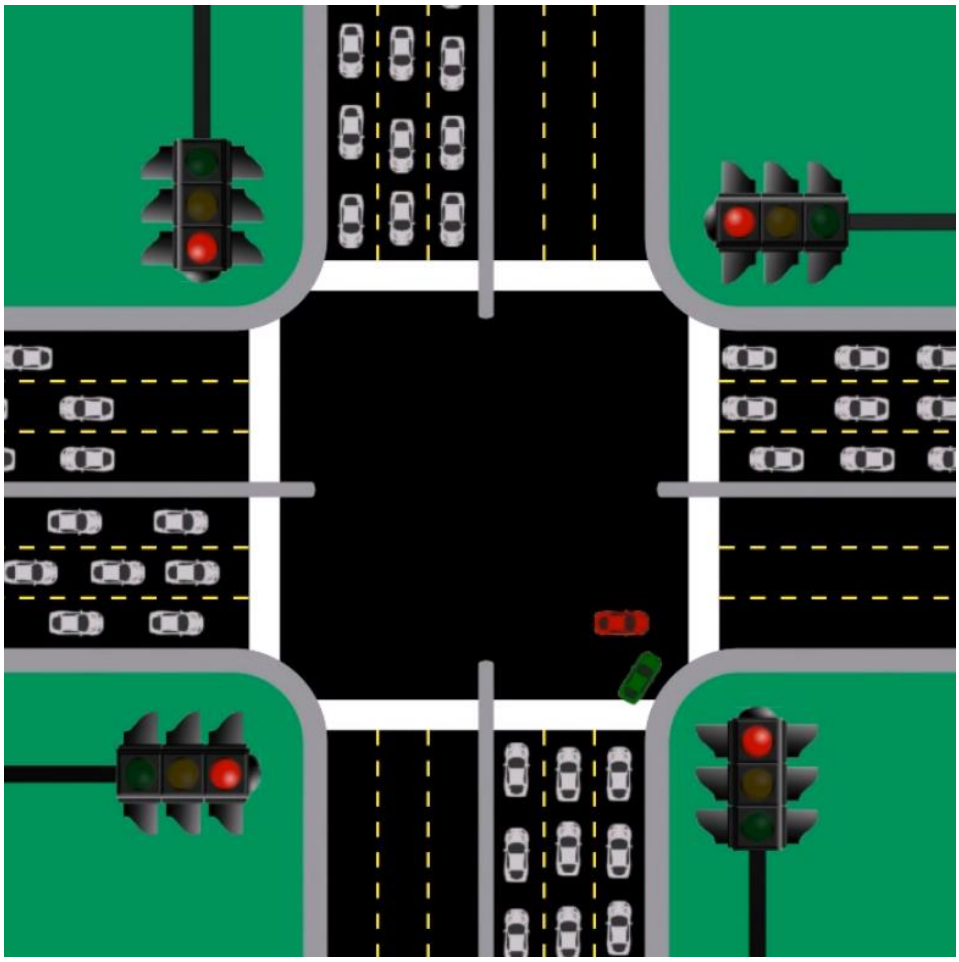

Figure 9. Prompt and video screenshot from the unjust driving scenario 5, depicting a red-light violation.

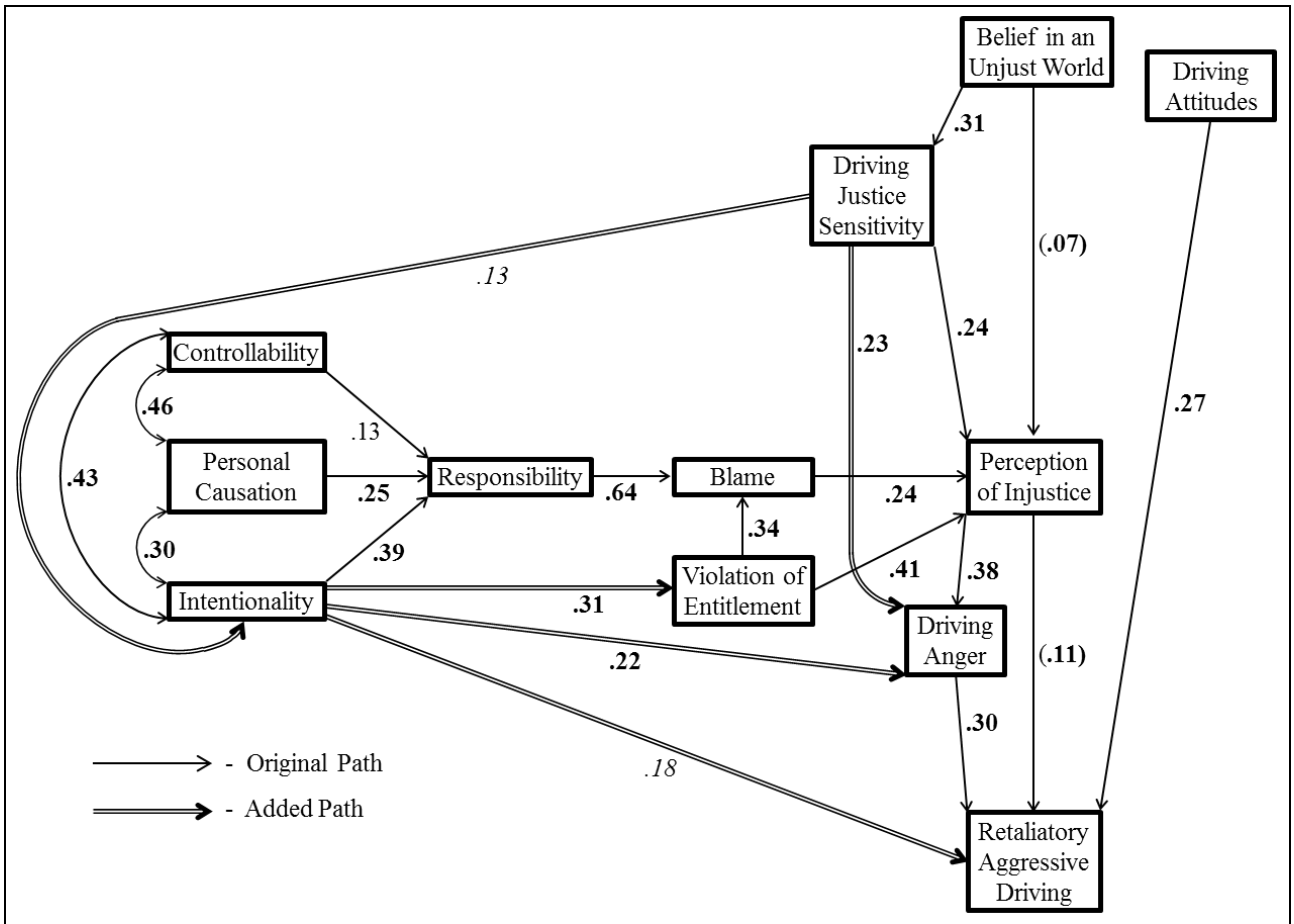

Figure 10. Final model of severity of retaliatory aggressive driving in response to a queuing violation (Scenario 1). All coefficients are standardized. Bold coefficients are significant at the $p < .01$. Italicized coefficients are significant at the $p < .05$ level. All other coefficients are not significant. Coefficients in parentheses are the standardized bootstrapped estimates of the indirect effect (i.e., Belief in an unjust world to perception of injustice via driving justice sensitivity, or perception of injustice to retaliatory aggressive driving via driving anger).

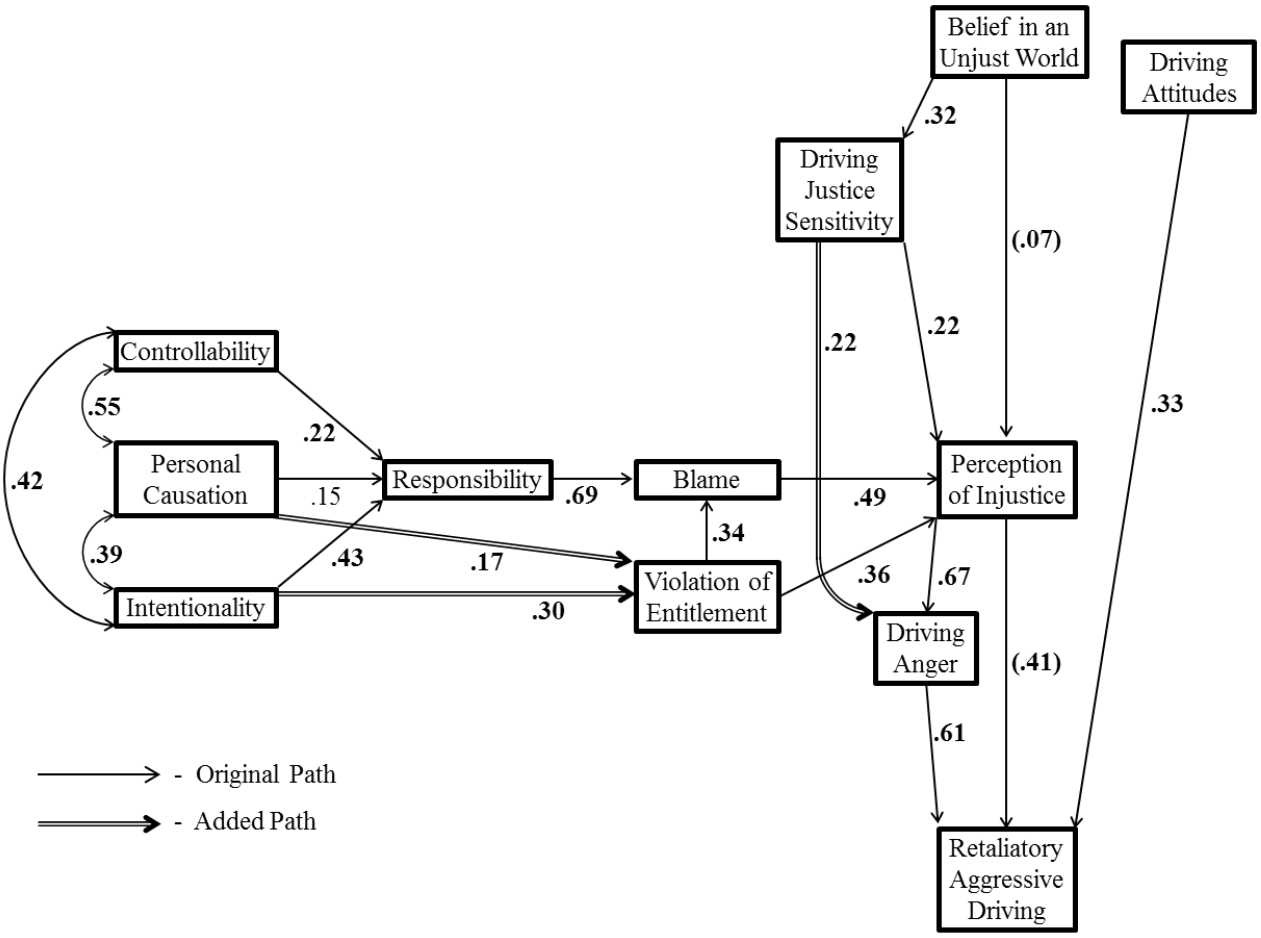

Figure 11. Final model of severity of retaliatory aggressive driving in response to a risky left-turn (Scenario 2). All coefficients are standardized. Bold coefficients are significant at the $p < .01$. Italicized coefficients are significant at the $p < .05$ level. All other coefficients are not significant. Coefficients in parentheses are the standardized bootstrapped estimates of the indirect effect (i.e., Belief in an unjust world to perception of injustice via driving justice sensitivity, or perception of injustice to retaliatory aggressive driving via driving anger).

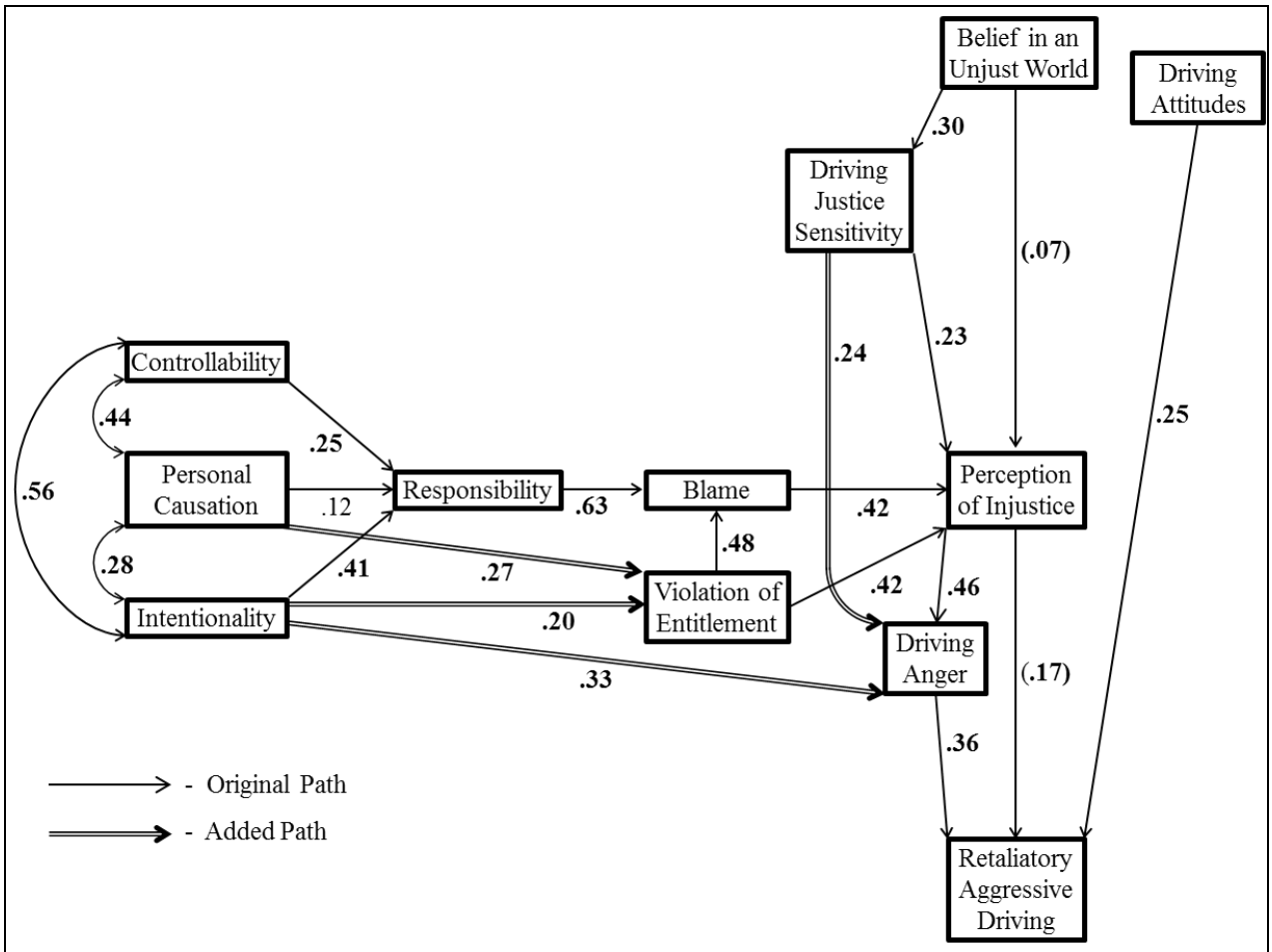

Figure 12. Final model of severity of retaliatory aggressive driving in response to a parking violation (Scenario 3). All coefficients are standardized. Bold coefficients are significant at the $p < .01$. Italicized coefficients are significant at the $p < .05$ level. All other coefficients are not significant. Coefficients in parentheses are the standardized bootstrapped estimates of the indirect effect (i.e., Belief in an unjust world to perception of injustice via driving justice sensitivity, or perception of injustice to retaliatory aggressive driving via driving anger).

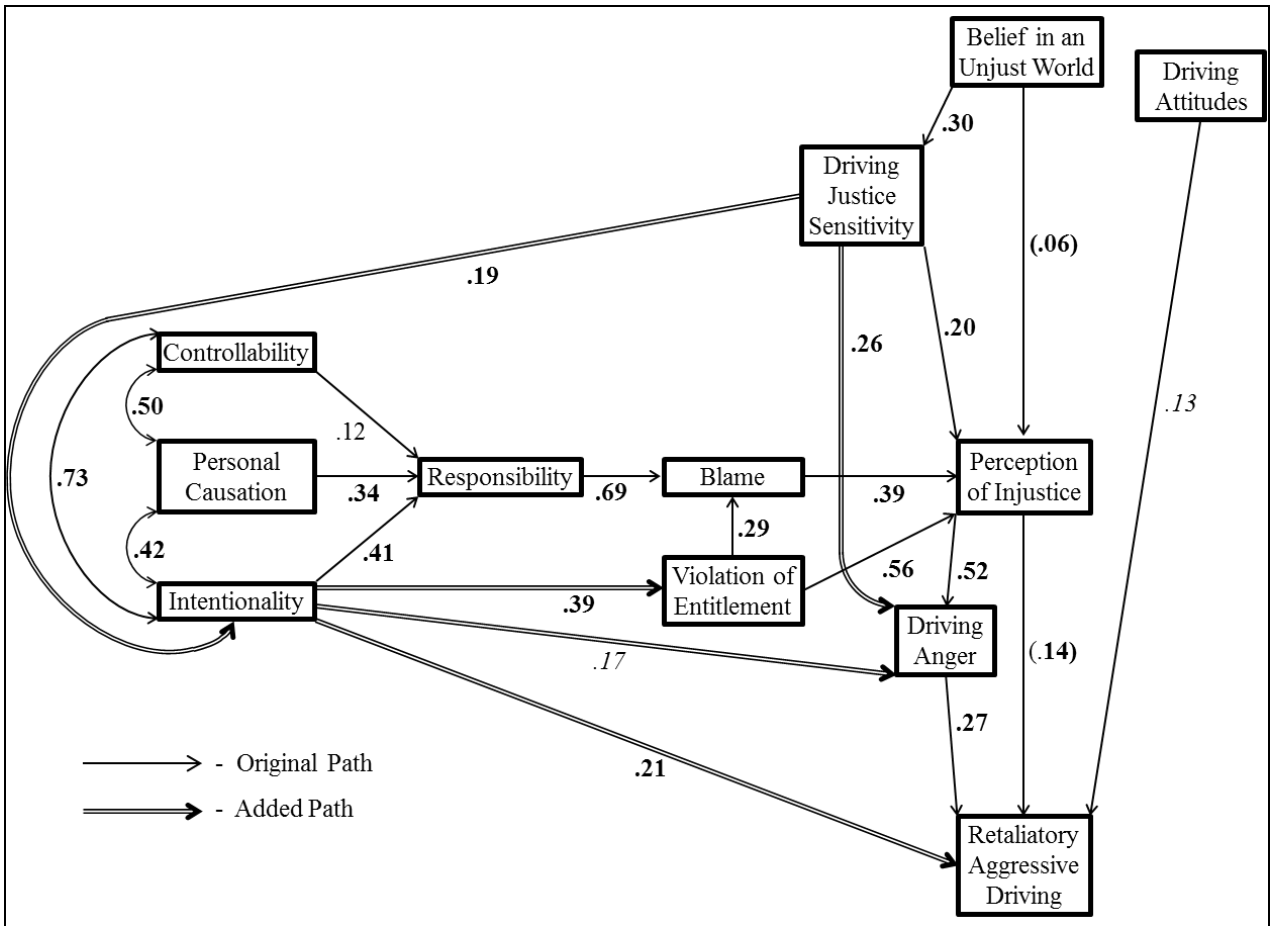

Figure 13. Final model of severity of retaliatory aggressive driving in response to a high-occupancy vehicle lane violation (Scenario 4). All coefficients are standardized. Bold coefficients are significant at the $p < .01$. Italicized coefficients are significant at the $p < .05$ level. All other coefficients are not significant. Coefficients in parentheses are the standardized bootstrapped estimates of the indirect effect (i.e., Belief in an unjust world to perception of injustice via driving justice sensitivity, or perception of injustice to retaliatory aggressive driving via driving anger).

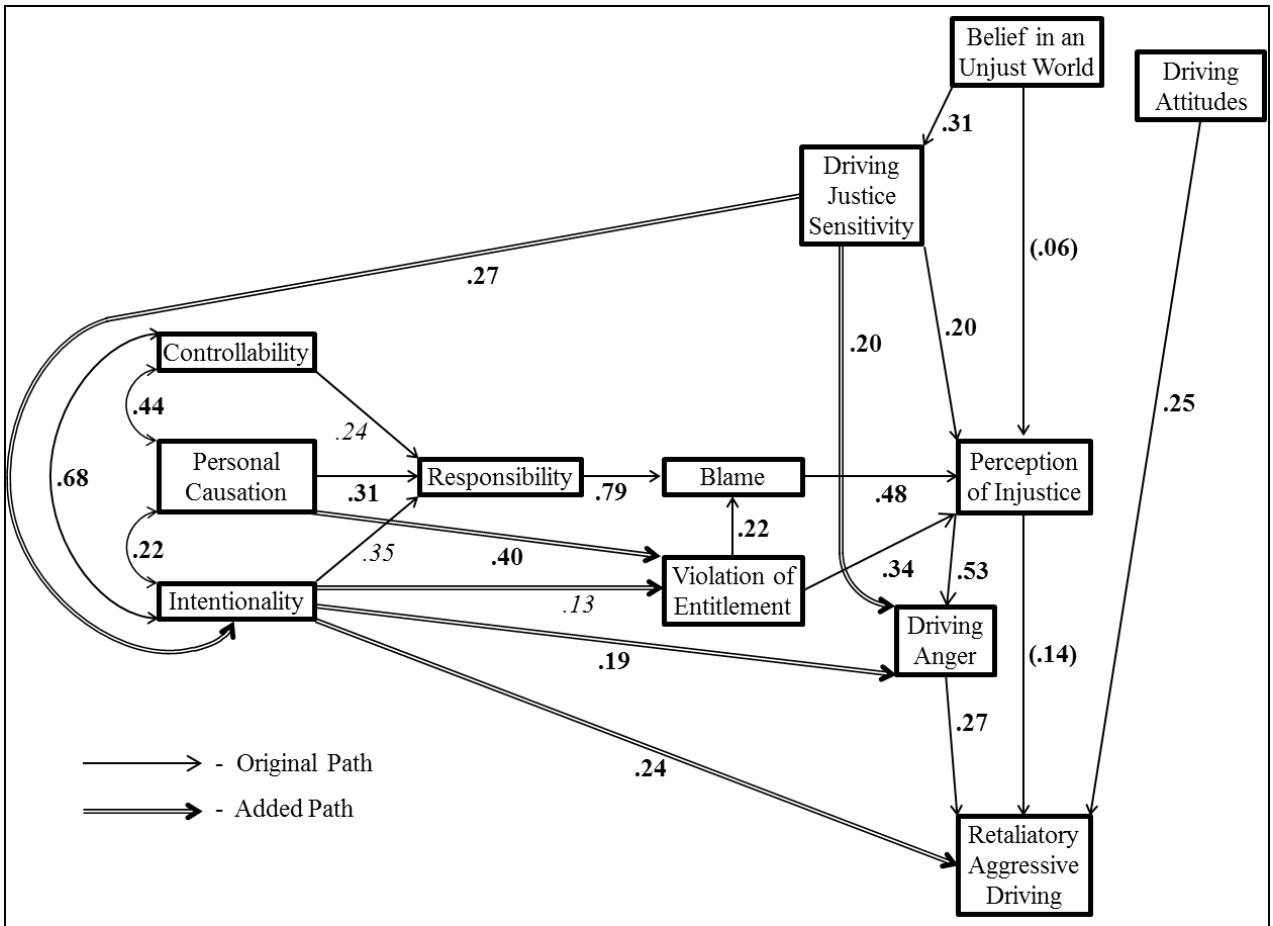

Figure 14. Final model of severity of retaliatory aggressive driving in response to a red-light violation (Scenario 5). All coefficients are standardized. Bold coefficients are significant at the $p < .01$. Italicized coefficients are significant at the $p < .05$ level. All other coefficients are not significant. Coefficients in parentheses are the standardized bootstrapped estimates of the indirect effect (i.e., Belief in an unjust world to perception of injustice via driving justice sensitivity, or perception of injustice to retaliatory aggressive driving via driving anger).

Appendix B

Informed Consent Form

Date: September, 2012
Study Name: Aggressive Driving: A Justice Perspective
Researchers: James Roseborough, 3rd Year Doctoral Candidate

Purpose of the Research: This research will examine the thoughts, feelings, and behavioural intentions experienced in the roadway environment.

What You Will Be Asked to do in the Research: You will begin the study by viewing a number of animated driving scenarios. After each scenario you will answer a questionnaire designed to capture the thoughts and feelings that you felt regarding the driving behaviour. You will then complete several questionnaires. On some questions you will be asked about your level of agreement with a certain statement, such as, "I feel that people get what they deserve". Combined, the two tasks should take approximately 90 minutes to complete.

Risks and Discomforts: We do not foresee any risks or discomfort from your participation in the research.

Benefits of the Research and Benefits to You: In exchange for your participation, you will receive (1.5) course credits. Your participation may also lead to the development of recommendations to enhance driver education and safety campaigns.

Voluntary Participation: Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer will not influence the nature of your relationship with York University either now, or in the future.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. If you choose to stop participating, you will still be eligible to receive the promised course credit for agreeing to be in the project. Your decision to stop participating, or refusing to answer particular questions, will not affect your relationship with the researchers, York University, or any other group associated with this project. Should you choose to stop participating, all data generated as a consequence of your participation will be destroyed.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Your responses will be transferred to a digital computer file which will be safely stored in a locked facility and only research staff will have access to this information. Your data will be entered using code numbers rather than by name. Following the completion of the data analysis, all data will be securely stored in a locked office for a minimum of two years. After the two year retention period all data will be destroyed using the Psychology Department's confidential document disposal service. Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research? If you have questions about the research in general please contact the main researcher, James Roseborough, either by telephone at (647) 300-9332, or by e-mail (j_rosie@yorku.ca). You can also contact the research supervisor, Dr. David L. Wiesenthal, either by telephone at (416) 736-2100, extension 30114 or by e-mail (davidw@yorku.ca). The Graduate Program in Psychology can be found in the Behavioural Science Building, room 297, and contacted by telephone at (416) 736-5290. This research has been reviewed and approved by the Human Participants in Research Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact Ms. Alison Collins-Mrakas, Manager, Research Ethics, 309 York Lanes, York University (telephone 416-736-5914 or e-mail acollins@yorku.ca).

Legal Rights and Signatures:
I_____, consent to participate in Aggressive Driving: A Justice Perspective conducted by James Roseborough. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Participant Signature:_____ **Date:**_____

Appendix C

Demographic Questionnaire

Please check **(√)** the appropriate box where applicable.

1. Age:_____

2. Gender: □ Male □ Female

3. Marital status **(check one)**:

□ Married (living with husband/wife) □ Separated / Divorced

□ Cohabiting (living with partner) □ Widowed

□ Single (not married and not living with partner) □ Other, please specify:_____

4. Driving Experience:

a) Number of **MONTHS** with G1 Driver's Licence _____

b) Number of **YEARS** with G2 Driver's Licence: _____

c) Number of **YEARS** with Full G Driver's Licence: + _____

d) Therefore, in total, how long have you been licensed to drive? _____

(**NOTE:** Your answers for a, b, and c should add up to equal your answer for d. In other words, a + b + c = d. Please use a decimal if needed)

5. On average, how many days per week do you drive? _____

6. On average, how many kilometres do you drive per: a) day___ b) week___ c) year___

7. On average, how much time (in hours) do you spend driving per: a) day_____ b) week____

NOTE: Please use a decimal if needed (e.g., 15 minutes = .25 hours).

8. Type of road most often driven **(check one)**:

□ Major Highway (e.g. 400, 401, 404, 407, 410, etc.)

□ Minor Highway (e.g. 2, 7, 10, etc.)

□ City Streets

9. Rate your driving abilities as compared to other drivers. Please insert a value between 0 and 100 in the space provided below. Your score can range from 0 (I'm at the very bottom) to 50 (I'm average) to 100 (I'm at the very top), and can include any number in between.

Compared to other drivers, I rate my driving abilities as: _____

10. Rate your use of safe driving habits as compared to other drivers. Please insert a value between 0 and 100 in the space provided below. Your score can range from 0 (I'm at the very bottom) to 50 (I'm average) to 100 (I'm at the very top), and can include any number in between.

Compared to other drivers, I rate my usage of safe driving habits as: _____

11. How often do you exceed the speed limit when driving? Estimate the percentage (e.g., 24% of the time OR 55% of the time OR 99% of the time) in the space provided below.

When driving, I exceed the speed limit _____ % of the time.

12. When you drive along a highway with a speed limit of 100 km/h, at what speed do you typically drive? _____ km/h

13. When you drive along a road with a speed limit of 60 km/h, at what speed do you typically drive? _____ km/h

14. How many tickets have you received for **moving** violations (e.g., speeding, running a red light, etc.)? _____ (**NOTE:** Do NOT include parking tickets in your answer!)

15. How many demerit points have you accumulated? _____

16. As a driver, in how many collisions (minor or major) have you been involved? _____

Appendix D

Unjust World Views Scale (Lench & Chang, 2007)

1. I should have more than what I get

2. The awful things that happen to me are unfair

3. Things generally do not work out in the end

4. Those who are unkind often have the most friends

5. People who do evil things get away with it

6. For me, things do not work out in the end.

7. When I am kind to others, they still do not want to be friends with me.

8. People who are kind to others still do not have friends.

9. For other people, things generally do not work out in the end.

Note. Items 1 through 5 are the original UWVS (Lench & Chang, 2007), and items 6 through 9 were created for this study.

Appendix E

Justice Sensitivity Scale - Victim (Schmitt, Gollwitzer, Maes, & Arbach, 2005)

1. It bothers me when others receive something that ought to be mine.

2. It makes me angry when others receive an award which I have earned.

3. I can't easily bear it when others profit unilaterally from me.

4. I can't forget for a long time when I have to fix others' carelessness.

5. It gets me down when I get fewer opportunities than others to develop my skills.

6. It makes me angry when others are undeservingly better off than me.

7. It worries me when I have to work hard for things that come easily to others.

8. I ruminate for a long time when other people are being treated better than me.

9. It burdens me to be criticized for things that are being overlooked with others.

10. It makes me angry when I am treated worse than others.

Appendix F

Driving Justice Sensitivity Scale - Victim

1. When driving, it bothers me when unsafe drivers benefit from my safe and proper driving.

2. When driving, it makes me angry when others take advantage of my courteous driving behaviour.

3. I cannot easily bear it when a driver disrespects me and benefits from it (e.g., gets through an intersection, merges into a line of cars).

4. When I am negatively affected by another driver's carelessness, I have a hard time forgetting it/letting-go.

5. It makes me angry when reckless drivers avoid traffic congestion (e.g., swerving, speeding).

6. It worries me when I have to work hard at performing driving maneuvers that come easily to others.

7. When driving, I ruminate for a long time when other people are being treated better than me.

8. When driving, it bothers me to be criticized (e.g., honked at, stopped by police) for same things that other drivers do and are overlooked.

9. It makes me angry when I am treated worse than other motorists (e.g., high-beamed, not given the right-of-way).

Appendix G

Driving Attitudes Scale

1. I think it is OK to speed if the traffic/weather conditions allow you to do so.

2. Driving 5 or 10 km/h above the speed limit is OK because everyone does it.

3. If you have good skills, speeding is OK.

4. If you are a safe driver, it is acceptable to exceed the speed limit by 10 km/h.

5. I would get in the car with a driver who has been drinking if I knew and trusted him or her.

6. Sometimes it is necessary to bend the rules to keep traffic going.

7. Sometimes it is necessary to bend the traffic rules to arrive in time.

8. Sometimes it is necessary to break the traffic rules in order to get ahead.

9. Sometimes it is necessary to take chances in the traffic.

10. It is more important to keep up the traffic flow rather than always follow the traffic rules.

11. There are many traffic rules which cannot be obeyed in order to keep up the traffic flow.

12. It is better to drive smooth than always follow the traffic rules.

13. A person who takes chances and violates some traffic rules is not necessarily a less safe driver.

14. Speeding and excitement belong together when you are driving.

15. Adolescents have a need for fun and excitement in traffic.

16. Driving is more than transportation, it is also speeding and fun.

17. You should always follow the traffic rules, regardless of the driving conditions.[R]

18. You should always obey laws while driving.[R]

19. If you are a safe driver, it is acceptable to exceed the speed limit by 40 km/h.

20. It is acceptable to drive at 140 km/h on a 100 km/h road if it is straight and there are no others vehicles in a kilometres distance.

21. It's acceptable to exceed the speed limit by 20 km/h.

22. When alone in the car, driving in a 'High Occupancy Vehicle' or 'carpool' lane is okay if I can get to my destination faster.

23. Driving in a "bus lane" is acceptable if I do not get in the way of the buses.

24. Driving for short distances on the shoulder of the highway is okay if I can avoid traffic.

25. It is acceptable to drive straight through an intersection while in a "right-turn only" lane if it does not affect anyone else.

26. There is nothing wrong with bypassing a line of cars and to the end of the lane, and then merging.

27. Taking another driver's parking space is okay if the other driver is too slow.

28. Driving through a crosswalk before a pedestrian is all the way across is okay if done safely.

29. It is not necessary to stop at a red-light if there are no vehicles nearby.

30. Driving or "rolling" through a stop-sign is OK if it is safe to do so.

31. Drivers should always use traffic signals when changing lanes or turning.

32. Turning at a time when turning is prohibited (e.g., no left-turns from 7-9 AM) is okay if there is no traffic.

33. I would never drive after drinking alcohol. [R]

34. Drunk drivers should have their licenses taken away and never be allowed to drive again. [R]

35. Laws prohibiting the use of cell phones while driving are not necessary.

Note. [R] = reverse scored. Items 1-5 are from Malfetti et al. (1989). Items 6-18 are from Ulleberg and Rundmo (2002). Items 19-21 were developed for this study, but based on items created by Malfetti et al. (1989). Items 22-35 were developed for this study.

Appendix H

Table 1

Factor loadings, communality values, variance accounted for, and reliability of negative driving attitudes

Attitude Items	Factor 1	Factor 2	h^2
1. If you have good skills, speeding is OK.	.70		.50
2. Sometimes it is necessary to break the traffic rules in order to get ahead.	.73		.54
3. Sometimes it is necessary to bend the traffic rules to arrive in time.	.73		.46
4. It's acceptable to exceed the speed limit by 20 km/h.	.67		.47
5. It is acceptable to drive at 140 km/h on a 100 km/h road if it is straight and there are no others vehicles in a kilometres distance.	.56		.44
6. There are many traffic rules which cannot be obeyed in order to keep up the traffic flow.	.56		.35
7. Driving or "rolling" through a stop-sign is OK if it is safe to do so.	.56		.31
8. Sometimes it is necessary to take chances in the traffic.	.50		.23
9. Turning at a time when turning is prohibited (e.g., no left-turns from 7-9 AM) is okay if there is no traffic.	.49		.36
10. You should always follow the traffic rules, regardless of the driving conditions.[R]	.44		.22
11. Driving for short distances on the shoulder of the highway is okay if I can avoid traffic.		.71	.48
13. It is acceptable to drive straight through an intersection while in a "right-turn only" lane if it does not affect anyone else.		.62	.37
14. Driving in a "bus lane" is acceptable if I do not get in the way of the buses.		.41	.25
Variance Explained (%)	32.05	6.74	
Reliability	.85	.64	

Note. h^2 = Communality; [R] = Item is reverse scored.

Table 2

Regression results for the influence of JSS-V and DJSS-V on perceptions of injustice

								95% CI			
Scenario	Step	Variable	b	S.E.b.	*B*	*T*	*p*	LL	UL	Part Correlation	R^2-change
1	1	Constant	2.31	0.14		16.90	.001	2.04	2.58		
		JSS-V	0.18	0.05	.23	3.81	.001	0.09	0.27	.23	.05***
	2	Constant	2.18	0.14		15.73	.001	1.91	2.46		
		JSS-V	0.07	0.06	.09	1.20	.233	-0.04	0.18	.07	
		DJSS-V	0.19	0.05	.25	3.53	.001	0.08	0.30	.21	.04***
2	1	Constant	3.04	0.14		21.29	.001	2.76	3.33		
		JSS-V	0.05	0.05	.06	0.93	.352	-0.05	0.14	.06	.00
	2	Constant	2.91	0.15		20.06	.001	2.62	3.19		
		JSS-V	-0.08	0.06	-.09	-1.29	.198	-0.19	0.04	-.08	
		DJSS-V	0.21	0.06	.27	3.66	.001	0.10	0.32	.22	.05***
3	1	Constant	2.14	0.16		13.18	.001	1.82	2.46		
		JSS-V	0.15	0.06	.16	2.58	.011	0.03	0.26	.16	.02*
	2	Constant	2.01	0.17		12.12	.001	1.68	2.33		
		JSS-V	0.03	0.07	.03	0.46	.647	-0.10	0.16	.03	
		DJSS-V	0.19	0.06	.22	2.99	.003	0.07	0.32	.18	.03**
4	1	Constant	2.45	0.16		15.11	.001	2.13	2.77		
		JSS-V	0.13	0.06	.14	2.29	.023	0.02	0.24	.14	.02*
	2	Constant	2.28	0.16		13.94	.001	1.96	2.60		
		JSS-V	-0.03	0.07	-.03	-0.38	.705	-0.16	0.11	-.02	
		DJSS-V	0.26	0.06	.29	4.08	.001	0.13	0.38	.24	.06***
5	1	Constant	3.22	0.12		26.15	.001	2.97	3.46		
		JSS-V	0.06	0.04	.08	1.29	.198	-0.03	0.14	.08	.01
	2	Constant	3.12	0.13		24.83	.001	2.87	3.37		
		JSS-V	-0.03	0.05	-.04	-.594	.553	-0.13	0.07	-.04	
		DJSS-V	0.14	0.05	.22	2.95	.004	0.05	0.24	.18	.03**

Note. JSS-V = Justice Sensitivity Scale (Schmitt et al., 2005); DJSS = Driving Justice Sensitivity Scale; b = unstandardized coefficient, S.E.b. = standard error of unstandardized coefficient, B = standardized coefficient, CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit.

*p < .05, **p < .01, ***p < .001.

Table 3

Means, standard deviations, and medians of attribution measures

Attribution/Perception	Statistic	Scenario				
		1	2	3	4	5
Causation	*M*	3.60	3.75	3.24	3.69	3.66
	SD	0.55	0.46	0.73	0.50	0.56
	Mdn	3.80	4.00	3.40	4.00	4.00
Controllability	*M*	3.34	3.57	3.53	3.47	3.49
	SD	0.64	0.62	0.60	0.63	0.63
	Mdn	3.50	4.00	3.75	3.75	3.75
Intentionality	*M*	3.11	3.29	3.35	3.31	3.14
	SD	0.68	0.72	0.74	0.72	0.76
	Mdn	3.25	3.50	3.50	3.50	3.25
Violation of Entitlement	*M*	3.29	3.50	1.93	2.91	3.60
	SD	0.85	0.82	1.39	1.09	0.73
	Mdn	3.00	4.00	2.00	3.00	4.00
Lack of Justification	*M*	2.93	3.37	2.81	3.16	3.38
	SD	0.69	0.66	0.92	0.71	0.66
	Mdn	3.00	3.50	3.00	3.25	3.75
Blame	*M*	3.58	3.73	3.35	3.55	3.64
	SD	0.77	0.65	1.00	0.71	0.67
	Mdn	4.00	4.00	4.00	4.00	4.00
Responsibility	*M*	3.68	3.77	3.64	3.72	3.79
	SD	0.63	0.60	0.67	0.57	0.44
	Mdn	4.00	4.00	4.00	4.00	4.00
Perception of Injustice	*M*	2.80	3.17	2.53	2.80	3.37
	SD	0.75	0.77	0.88	0.88	0.66
	Mdn	3.00	3.33	2.67	3.00	3.67

Note. *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median

Table 4

Attribution measure items and reliability coefficients for the five scenarios

Attribution	Item(s)	Scenario Reliability				
		1	2	3	4	5
Causation	1. Your behavior caused the other driver to act the way he/she did.[R] 2. If you had acted differently the driver could have avoided such a behaviour.[R] 3. You have done something to deserve what happened.[R] 4. The incident that occurred was due to the other driver's behaviour. 5. The incident that occurred was due to your behaviour.[R]	.68	.71	.74	.76	.76
Controllability	1. The cause of the event (i.e., the cause of the other driver cutting you off) was beyond the driver's power.[R] 2. The other driver had the possibility to make another decision. 3. The other driver had the possibility of acting in a different way. 4. The other driver was somehow forced to act the way he/she did.[R]	.54	.65	.66	.64	.74
Intentionality	1. The other driver deliberately cut you off. 2. The other driver did not wait in line, just to save time. 3. The other driver accidently acted the way he/she did.[R] 4. The person(s) who caused the incident acted on purpose.	.64	.72	.80	.82	.82
Lack of Justification	1. The other driver had every right to behave the way he/she did.[R] 2. The other driver deserves to be punished in some way for their behaviour. 3. The other driver was justified to act the way he/she did.[R] 4. The other driver acted the way he/she did for good reasons.[R]	.68	.73	.77	.68	.71
Violation of Entitlement	1. The behaviour of the driver of the red car is a serious violation of what you are entitled to (e.g., rights, safety) as a driver.	–	–	–	–	–
Responsibility	1. The other driver responsible is for his/her behaviour.	–	–	–	–	–
Blame	1. The other driver should be blamed for his/her behaviour.	–	–	–	–	–
Perception of Injustice	1. The situation you just witnessed was extremely unjust. 2. The driver's behaviour is a serious offence. 3. If I saw another driver perform the same behaviour, I would be extremely angered.	.61	.69	.67	.75	.61

Note. [R] = Item is reverse scored.

Table 5

Wilcoxon-Mann U and Z-statistics for anger and aggression gender comparisons

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Anger	Mann-Whitney *U*	7753.0	8154.0	8455.0	8495.5	7485.0
	Z-statistic	-1.46	-0.79	-0.27	-0.19	-2.02
	p	.145	.431	.784	.848	.044
	abs(r)	.09	.05	.02	.01	.12
Aggression	Mann-Whitney *U*	6692.5	6603.5	7299.5	7454.0	7237.0
	Z-statistic	-2.38	-3.23	-1.72	-1.15	-2.04
	p	.017	.001	.086	.251	.041
	abs(r)	.15	.20	.11	.07	.12

Table 6

Spearman rho correlation coefficients between age and anger, and age and aggression

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Anger	r_s	-.20	-.10	-.18	-.04	-.07
	p	.001	.114	.004	.564	.269
Aggression	r_s	.06	.07	-.02	-.01	.08
	p	.360	.268	.785	.875	.218

Table 7

Pearson Correlations Between Model Variables for Scenario 1

Variable	1	2	3	4	5	6.	7	8	9	10	11	12	13	*M*	*SD*
1. Causation	–													3.64	0.47
2. Controllability	.46	–												3.34	0.64
3. Intentionality	.29	.42	–											3.14	0.66
4. VOE	.12	.15	.23	–										3.32	0.81
5. LOJ	.29	.36	.44	.46	–									2.97	0.67
6. Responsibility[a]	.36	.26	.41	.13	.26	–								3.72	0.53
7. Blame[a]	.34	.32	.42	.34	.36	.50	–							3.63	0.68
8. POI	.11	.11	.30	.53	.55	.17	.32	–						2.84	0.74
9. DJS	-.13	-.19	.11	.15	.12	.02	.05	.32	–					2.32	0.99
10. BUW	-.03	-.16	-.01	.10	.12	-.08	-.02	.26	.34	–				2.38	0.58
11. Attitudes	.02	-.01	.10	.07	-.03	-.08	.06	.04	.10	.21	–			2.10	0.76
12. Driving Anger[a]	.13	.11	.34	.24	.38	.11	.25	.50	.31	.13	.08	–		2.72	0.97
13. RAD[a]	.05	.07	.31	.15	.21	.10	.21	.25	.16	.06	.22	.38	–	4.62	2.14
14. Age	-.02	.10	.12	.05	.06	.16	.11	.05	-.17	-.04	-.10	-.19	.07	21.68	0.58

Note. [a] = Spearman rho correlation coefficients are reported for these variables; VOE = Violation of Entitlement; LOJ = Lack of Justification; POI = Perception of Injustice; DJS = Driving Justice Sensitivity; BUW = Belief in an Unjust World; RAD = Retaliatory Aggressive Driving.

$p = .05 = r \geq .13$, $p = .01 = r \geq .17$, $p = .001 = r \geq .21$, two-directional.

$p = .05 = r \geq .11$, $p = .01 = r \geq .15$, $p = .001 = r \geq .20$, one-directional.

N = 253

Table 8

Pearson Correlations Between Model Variables for Scenario 2

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	*M*	*SD*
1. Causation	–													3.79	0.39
2. Controllability	.54	–												3.60	0.57
3. Intentionality	.39	.38	–											3.33	0.69
4. VOE	.26	.21	.27	–										3.57	0.71
5. LOJ	.42	.57	.49	.43	–									3.42	0.59
6. Responsibility[a]	.38	.40	.37	.36	.37	–								3.83	0.41
7. Blame[a]	.47	.41	.51	.48	.44	.53	–							3.79	0.50
8. POI	.24	.29	.38	.63	.60	.37	.44	–						3.22	0.71
9. DJS	-.19	-.11	.05	.03	.08	.07	-.06	.22	–					2.33	0.99
10. BUW	-.13	-.10	.10	-.02	-.01	-.02	-.10	.05	.33	–				2.36	0.58
11. Attitudes	-.09	-.06	-.01	-.04	-.11	-.06	-.08	-.01	.12	.20	–			2.12	0.76
12. Driving Anger[a]	.18	.30	.29	.39	.45	.26	.33	.61	.32	.11	.02	–		3.18	0.95
13. RAD[a]	.01	.10	.14	.15	.20	.11	.11	.24	.26	.11	.27	.48	–	4.25	1.72
14. Age	-.07	.02	.03	-.06	.03	.03	.03	-.03	-.17	-.05	-.10	-.10	.07	21.60	5.32

Note. [a] = Spearman rho correlation coefficients are reported for these variables; VOE = Violation of Entitlement; LOJ = Lack of Justification; POI = Perception of Injustice; DJS = Driving Justice Sensitivity; BUW = Belief in an Unjust World; RAD = Retaliatory Aggressive Driving.

$p = .05 = r \geq .13$, $p = .01 = r \geq .16$, $p = .001 = r \geq .21$, two-directional.

$p = .05 = r \geq .11$, $p = .01 = r \geq .15$, $p = .001 = r \geq .20$, one-directional.

N = 259.

Table 9

Pearson Correlations Between Model Variables for Scenario 3

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	*M*	*SD*
1. Causation	–													3.24	0.73
2. Controllability	.41	–												3.53	0.60
3. Intentionality	.30	.52	–											3.36	0.73
4. VOE	.21	.22	.17	–										1.95	1.38
5. LOJ	.40	.51	.47	.51	–									2.82	0.91
6. Responsibility[a]	.29	.41	.52	.15	.33	–								3.65	0.62
7. Blame[a]	.44	.48	.52	.35	.50	.47	–							3.38	0.95
8. POI	.25	.31	.35	.66	.64	.33	.48	–						2.55	0.87
9. DJS	-.10	-.13	.10	.15	.16	-.06	.06	.24	–					2.30	1.00
10. BUW	-.17	-.10	-.06	.13	-.02	-.18	-.04	.15	.32	–				2.37	0.59
11. Attitudes	-.12	-.04	-.06	.05	-.00	-.04	-.06	.11	.13	.19	–			2.11	0.76
12. Driving Anger[a]	.13	.35	.44	.28	.47	.25	.40	.55	.30	.10	.16	–		3.22	1.07
13. RAD[a]	.08	.19	.19	.23	.34	.14	.34	.37	.20	.08	.18	.42	–	4.19	2.01
14. Age	.00	-.01	-.14	.02	-.04	.00	.01	-.01	-.21	-.02	-.10	-.17	-.02	21.48	5.10

Note. [a] = Spearman rho correlation coefficients are reported for these variables; VOE = Violation of Entitlement; LOJ = Lack of Justification; POI = Perception of Injustice; DJS = Driving Justice Sensitivity; BUW = Belief in an Unjust World; RAD = Retaliatory Aggressive Driving.

$p = .05 = r \geq .13$, $p = .01 = r \geq .16$, $p = .001 = r \geq .21$, two-directional.

$p = .05 = r \geq .11$, $p = .01 = r \geq .15$, $p = .001 = r \geq .19$, one-directional.

N = 264.

Table 10

Pearson Correlations Between Model Variables for Scenario 4

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	*M*	*SD*
1. Causation	–													3.71	0.46
2. Controllability	.50	–												3.49	0.61
3. Intentionality	.38	.60	–											3.36	0.68
4. VOE	.14	.30	.27	–										2.96	1.06
5. LOJ	.45	.62	.55	.47	–									3.19	0.70
6. Responsibility[a]	.47	.48	.50	.28	.40	–								3.74	0.52
7. Blame[a]	.52	.46	.46	.42	.48	.55	–							3.59	0.65
8. POI	.24	.44	.45	.72	.61	.38	.50	–						2.86	0.84
9. DJS	-.11	.03	.13	.12	.15	-.04	.16	.26	–					2.30	0.99
10. BUW	-.16	-.04	-.01	.09	.02	-.08	.11	.12	.32	–				2.39	0.57
11. Attitudes	-.13	-.04	.01	-.10	-.16	-.09	-.06	-.06	.14	.21	–			2.10	0.76
12. Driving Anger[a]	.16	.33	.40	.44	.45	.27	.39	.60	.40	.10	-.04	–		2.74	1.14
13. RAD[a]	.10	.25	.28	.24	.27	.17	.23	.32	.22	.07	.14	.38	–	4.70	2.28
14. Age	.02	.10	.03	.02	.06	.11	-.02	.05	-.17	-.03	-.10	-.03	-.01	21.69	5.44

Note. [a] = Spearman rho correlation coefficients are reported for these variables; VOE = Violation of Entitlement; LOJ = Lack of Justification; POI = Perception of Injustice; DJS = Driving Justice Sensitivity; BUW = Belief in an Unjust World; RAD = Retaliatory Aggressive Driving.

$p = .05 = r \geq .13$, $p = .01 = r \geq .17$, $p = .001 = r \geq .21$, two-directional.

$p = .05 = r \geq .11$, $p = .01 = r \geq .15$, $p = .001 = r \geq .20$, one-directional.

N = 254.

Table 11

Pearson Correlations Between Model Variables for Scenario 5

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	*M*	*SD*
1. Causation	–													3.71	0.50
2. Controllability	.42	–												3.54	0.60
3. Intentionality	.22	.54	–											3.19	0.73
4. VOE	.37	.26	.15	–										3.66	0.63
5. LOJ	.41	.64	.50	.37	–									3.41	0.64
6. Responsibility[a]	.36	.48	.31	.40	.41	–								3.82	0.39
7. Blame[a]	.55	.59	.42	.45	.52	.56	–							3.71	0.55
8. POI	.32	.43	.33	.58	.58	.41	.48	–						3.41	0.62
9. DJS	-.03	.02	.20	.04	.10	.04	.06	.23	–					2.28	0.99
10. BUW	-.09	-.11	.04	-.06	-.08	-.05	-.02	.04	.33	–				2.37	0.59
11. Attitudes	-.14	-.13	-.07	-.09	-.20	-.13	-.07	-.01	.12	.20	–			2.11	0.77
12. Driving Anger[a]	.32	.38	.32	.34	.38	.23	.39	.57	.31	.01	.03	–		3.37	0.88
13. RAD[a]	.13	.18	.24	.09	.19	.14	.21	.28	.24	.07	.21	.35	–	4.22	1.70
14. Age	-.04	-.02	-.06	-.03	.03	.14	.06	.05	-.19	-.05	-.11	-.08	.07	21.69	5.36

Note. [a] = Spearman rho correlation coefficients are reported for these variables; VOE = Violation of Entitlement; LOJ = Lack of Justification; POI = Perception of Injustice; DJS = Driving Justice Sensitivity; BUW = Belief in an Unjust World; RAD = Retaliatory Aggressive Driving.

$p = .05 = r \geq .13$, $p = .01 = r \geq .17$, $p = .001 = r \geq .21$, two-directional.

$p = .05 = r \geq .11$, $p = .01 = r \geq .15$, $p = .001 = r \geq .20$, one-directional.

N = 255.

Table 12

Summary of indirect effect analyses of belief in an unjust world on perceptions of injustice via driving injustice sensitivity

						95% CI		
Scenario	b	S.E.b	*B*	*T*	*p*	LL	UL	K^2
1	0.09	0.03	.07	2.94	.003	0.04	0.17	.07
2	0.08	0.03	.07	2.71	.006	0.04	0.16	.07
3	0.10	0.03	.07	2.88	.004	0.04	0.18	.06
4	0.09	0.03	.06	3.04	.002	0.04	0.15	.05
5	0.07	0.02	.06	2.96	.003	0.03	0.12	.10

Notes. b = unstandardized coefficient, S.E.b. = standard error of unstandardized coefficient, B = standardized coefficient, CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit; K^2 = Kappa-squared.

Table 13

Summary of indirect effect analyses of perceptions of injustice on retaliatory aggressive driving via driving anger

						95% CI		
Scenario	b	S.E.b	*B*	*T*	*p*	LL	UL	K^2
1	0.18	0.07	.11	2.73	.006	0.08	0.35	.06
2	0.75	0.24	.41	3.08	.002	0.40	1.28	.26
3	0.24	0.08	.17	3.16	.002	0.11	0.42	.09
4	0.20	0.09	.14	2.14	.031	0.04	0.41	.06
5	0.27	0.16	.14	1.70	.090	0.03	0.61	.10

b = unstandardized coefficient, S.E.b. = standard error of unstandardized coefficient, B = standardized coefficient, CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit K^2 = Kappa-squared.

Appendix I

Retaliatory Aggressive Driving Items

Instructions: Below are a number of behaviours. Indicate the behaviour you would most likely perform in response to the other driver's behaviour.

- ○ Do nothing at all in response to the other driver's behaviour.
- ○ Swear at the other driver in response to his/her behaviour.
- ○ Give the middle finger in response to the other driver's behaviour.
- ○ Honk your horn briefly in response to his/her behaviour.
- ○ Honk your horn continuously in response to his/her behaviour.
- ○ Tailgate the other driver in response to his/her behaviour.
- ○ Speed up and cut-off the other driver in response to his/her behaviour.